Vol. 5 NOVEMBER, 1924 No. 4

JOURNAL OF MAMMALOGY

Published Quarterly by the American Society of Mammalogists

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PRINTED BY

WILLIAMS & WILKINS COMPANY

MOUNT ROYAL AND GUILFORD AVENUES

BALTIMORE, MARYLAND

Entered as second-class matter, November 22, 1919, at the Postoffice, Baltimore, Md., under the Act of March 3, 1879.

Made in United States of America

The American Society of Mammalogists

Founded April 3, 1919
Incorporated April 29, 1920

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The Journal of Mammalogy

Subscription rates, $3.50 per year; single numbers $1.00 each. Sent free to all members of the American Society of Mammalogists not in arrears for dues.

Manuscripts for publication, books and papers for notice and review, etc., should be sent to the Editor, N. Hollister, National Zoological Park, Washington, D. C.

Subscriptions, changes of addresses, requests for missing numbers, applications for advertising rates, etc., should be sent to the Corresponding Secretary, Dr. Hartley H. T. Jackson, Biological Survey, Washington, D. C.

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A LETTER TO AUDUBON

BY GEO. BIRD GRINNELL

Among some of my old papers I find a letter from Thomas Lincoln of Dennysville, Maine, which is evidently a reply to questions about mammals addressed to him by the elder Audubon.

The name Lincoln is, perhaps, better known to ornithologists than to those interested in mammals, for Lincoln was one of John James Audubon's party who sailed to Labrador in 1833 on the famous schooner "Ripley." He was a close friend of John Woodhouse Audubon, whose senior he was by about six months. He was born March 27, 1812, and died 71 years later, March, 1883.

Thomas Lincoln was a lawyer and, presumably, practiced in Dennysville and vicinity, where his father, Judge Lincoln, was at one time a large landholder, having owned two townships of land. As was natural from his early associations, Lincoln felt a real interest in natural history matters, and it was quite to be expected that Audubon should have applied to him for possible information on the mammals of Maine.

The letter, dealing almost entirely with the larger mammals, contains no new material but to my mind possesses a certain historical interest. It was written before the envelopes to which we are accustomed came into use. It shows, as will be seen, the postmark, giving place and date of mailing, the cost of transportation, the address, and Mr. Audubon's endorsement. As sent through the mail the address was written on the back of the last sheet of the letterpaper, which was folded over so as to show only the postmark and the address. It was then sealed with an oldfashioned red wafer. After the letter had been opened and read, the recipient made his endorsement on the side of the package

opposite the address. It will be seen that Mr. Audubon made prompt acknowledgment of the letter—only a week after its mailing.

New York City.

Dennysville 17th Nov. 1846.

John J. Audubon Esq.

My dear Sir

It is now more than a year, perhaps more than two, since I received a letter from my old friend—your son John Audubon—requesting some particulars concerning the quadrupeds in the forests of this region. I was very glad indeed to have a word of remembrance from him after so long a time—and as you may suppose answered it without delay—at great length, not only by giving him many items in natural history—but in comparing private notes;—all of which he had written concerning himself and all the other members of his family being very interesting to me. I never heard from him afterwards—Last March, your letter was received—and as you did not speak of having heard from me, I was forced to conclude that my letter had miscarried—which I regretted very much—not so much on account of the importance of the matter conveyed—for it was not in my power to furnish very valuable matter—but that his kind letter should seem to have been forgotten. But what apology can be made for allowing your very acceptable letter to remain so long unanswered! If I could explain it better to myself, one might be rendered which would be more satisfactory—but as it has often happened with me and every man probably who is subject to the infirmity of procrastination—especially in epistolary correspondence—I neglected to answer that letter, the longest time, which I was desirous of answering the most fully, and should really have been the most grieved to believe would have been long omitted. Your letter was received just as I was on the point of leaving home to be absent a number of weeks. I immediately took measures to obtain the different specimens you spoke of—as well as to furnish myself with the desired information to transmit to you—and wrote to a friend who was in a way to obtain measurements &c of the different species of deer. As I much feared it was then too late to catch the deer—the snow being nearly wasted away in the woods—and I did not hear of a black fox being caught any where about in this region, and no others any where within my reach. When I returned it seemed proper to wait till the last moment before I should send so unsatisfactory an account—in hopes that something should fall in my way: and so it has since remained. I hope you will see however from this letter, meager as it may be in information of interest to you—that my *zeal* in serving you in a naturalist's line has not abated—so to waste no more time in apology or explanation, I will lug out all the little I have.

As to the karabou—In the early and mid-winter it keeps about the numerous lakes and ponds in this region—because upon them the snow is never so deep as in the woods: it also frequents, in the early part of the winter, (I suppose the greater part of the summer also) the "heaths" or bogs which also abound and some of which are very large, and, in consequence, favorite resorts of these deer—On these bogs and on the margin of the lakes—in the winter they feed principally on a long green (light green) hairy moss which always grows most

plentifully in such exposed situations as the stinted trees and scattering bushes on the heaths—and the ragged and matted trees on the borders of lakes: When the snow begins to stiffen in the spring by the influence of the brighter sun, which makes a more compact surface—the karabou for the most part leave the lakes and take to the woods. I *believe*—on the bogs—that as the snow grows deeper in the winter—they confine their range somewhat to those situations where the snow is less deep or betake themselves to the ponds where the snow is shoaler than on the bogs. On the bogs it is rather deeper (on account of the undergrowth of shrubs) than in the woods;—unless it be after a thaw—when it settles of course more on the exposed surface of the heath. In the summer, I do not so well know what they live upon, or where they resort: When pursued on the lakes in the winter they will not readily leave them—but run round the margin or across with such swiftness, that pursuit is unavailing; they are shot therefore mostly by the lying in wait of the one who is hunting them. These animals are according to the best accounts I can get of them (having, as it has so happened, never seen them, myself that I now recollect) are *very* swift—putting the speed of the fleetest dogs entirely at defiance; this I think may be considered as *unquestionable*, for I have always heard the same account given of the hopelessness of pursuit by dogs—from every one who has had any experience—I never heard any one boast of having a dog who would be of more service in running a karabou down, than in overtaking a crow. Indeed if it were possible to do any thing in hunting them on the lakes by troops of dogs—why it is plain enough they would not be found there—The very fact of their maintaining their position seems to me evidence enough of their unapproachable fleetness. I am sorry not to be able to give you any thing more definite, or any thing concerning this point, of my own personal knowledge. These American reindeer are said to trot very rapidly, but it is when they break into the run that they leave every thing behind. I heard of one which was pursued upon a lake for three or four days by successive parties—and so at last *run down*. It was said to have had the hair (the hair is exceedingly brittle in the winter) chafed all off of the fore shoulders by the sharp hoofs of the hind feet—showing that they throw themselves a great way at a leap; I have no reason to doubt the accuracy of this. The common deer as you know is not so remarkably swift; although its motion is so beautiful—so bird-like It is true—that there are some of them, which exhibit a speed and endurance *absolutely unaccountable*—when compared with that of the greater number of them—so much so that I have been sometimes inclined to question—whether they may not all possess a speed—which owing to fright or something else, they do not except under some peculiar circumstances exhibit: this however is more difficult to believe than the other and I cannot but believe that the animal in general is not a fleet one. I have repeatedly seen them overtaken in fair running by good dogs. Neither is the moose-deer, probably, nearly so swift as the karabou. I suspect that the animal (the moose) seldom *if ever* breaks out of a trot—I have seen the very young ones do it however.

As to the Moose I do not know that I am acquainted with any facts—which you would not probably already know. I regret very much that I have not any measurements of these animals—which would exhibit their singular shape.

The common deer. The only observations I have to make, which might contain any thing new to you are these 1st They are very much larger in Maine (I know not how it is farther westward on the same parallell) than they are in the middle and western states. I have also understood that as you go still farther southward, also, they are smaller, till in Florida a man may ordinarily swing one over his back, carrying him by the hind legs. The measurements given by Godman—were much exceeded by a young *doe* in my possession—and the bucks—full grown, of course are large indeed compared with such a one—There was sold in Machias last fall one which was said to weigh sixty pounds a quarter, and as there was no mast in the woods that season, it was of course not so heavy as it would be in ordinary seasons. This however was a very extraordinary one as to size:—forty pounds a quarter I should think was not at all unusual. I suspect too that in this northern climate they are much fatter in the autumn, and towards winter—than in the middle states—perhaps it may be from the comparative absence of flies—as well as the cooler climate. At this season they are generally found like the fattest mutton. They grow poor enough however towards spring when the greater numbers are caught—being all shrunk up to nothing—there being none but some of the does, which retain any flesh upon their bones more than is necessary to hold them together. There is another difference between those found here and farther southward; their horns—though proportionally heavy are not so *branched:* the prongs are fewer and the whole horn is more massy and stout—some of them very large and heavy. I could satisfy you of the correctness of this if I were able to show you the horns of ours—to compare with the southern ones—this is a matter of little consequence enough perhaps—but then every little peculiarity may prove to be of interest some time or other. (I am aware that the antlers are usually more branched as the animal grows older, so I am not misled by that) The habits of the animal are altogether too well known to you to make it worth while for me to detail any little peculiarities occasioned by the nature of the country here. In the summer and autumn they are more often killed here by paddling up to them gently in canoes as they stand on the margins of the lakes or rivers as they evince little mistrust when they do not scent their pursuer—The moose is seldom killed at that time except by Indians—who paddle along the rivers and streams—with a *wonderful silence.* The paddle is not taken from the water, only moved *in it,* and the canoe is urged along very gently. a *drop of water from the paddle* falling or a ripple at the bow of the canoe in these still—these (at times) *wonderfully, painfully* silent forests—would sound at such times—in comparison with the profound silence and quiet, like (you will smile) like a good deal of a noise. I suspect these northern forests—especially the tall dark pine and hemlock growth—the "black growth" as it is called are stiller than they are elsewhere—less insects or birds or something which would break the awful silence. I do not know but you had opportunity to remark it when you were here—I have heard others express their astonishment at it—particularly a gentleman who has spent much time in the forests, as a naturalist, in most all parts of this northern continent—Mr. Peale. But I shall seem to be digressing—I only wanted to convey to you some idea of the profound silence in which the canoe moves along the margin of the lakes surrounded by the tall woods or along the rivers and small streams—almost overarched with the trees on the

border. *So cautious and so keen of hearing* is this animal that it cannot otherwise be approached. Its "note" is indescribable—it is a long, *winding*, hollow sound—*interrupted* something after the fashion of the bray of the ass—but not so *diabolical* in sound—its tone something like a horn—but plaintive and "hollow"—and with a very little of a kind of *twang* as if "through the nose." Here you have the best description I can give of it who have never heard the veritable animal (except the *whining* of some which were caught—they keep up a whining when interfered with just as the camel does) I have only heard the imitation of the sound as given by the hunters—They take a piece of birch bark and twist it up something into the shape of a horn with which to give the peculiar *tone* —and then with the deep, sonorous, and peculiar voice of the Indian—we have a faithful imitation without doubt. Well as I was going to say in August and September that is the time when the animal will follow the sound—the canoe glides along in this silence, the dark and shaded little streams—and at intervals the Indian stops in the deep shade—and "opens," with his birch bark horn —which the moose hearing—comes rushing down to the margin to discover his error too late, and as he appears through the dense growth is shot. I have made a long story but I wanted to give you some understanding of the manner of hunting—which I could not with less words. The Karabou in his motion is unlike the common deer—inasmuch as he "runs lower"—does not have so much parade of motion—that kind of *vaulting*, and when he leaps over obstructions, he does not leap as if he were in sport—but *just high enough* to clear the object safely—as a good horse does, and no higher. There is one peculiarity the moose has in feeding unlike either of the other deer, which is in often stripping with the front teeth on the lower jaw, stripping up the bark on the young maples, from three feet above the ground, to as high as he can reach—which is no moderate height—the hunters fancy they can form some estimate of the size of the moose who has gone along from this mark. They seldom or never make more than one such on a tree (the mark of each tooth distinctly visible) and I believe that this is not usually resorted to till about the time of the year when the snows approach, and they gradually confine themselves to what is called a "yard." A yard is discovered frequently perhaps generally by following these marks, being of course on the side of the tree from which the animal comes—showing that at that period they have entirely done ranging, and barely move along step by step as it were in feeding. The common deer is quite bold coming about the settlements and into the pastures—but the moose and karabou—keep as far from the sight and sound of man as the poor creatures can—they have no great opinion of civilization, which is not altogether wonderful.

As to the Wolf. I will only undertake to give you some little particulars of his history hereabouts—When the first settlers came here some sixty years ago; "the last of the Mohicans" the very last straggling wolves—some one or two were seen in the country—they were all gone—for many years the animal was *entirely* unknown—there were *absolutely none*. This was the more remarkable inasmuch as no father West than the Kennebec—perhaps even the Penobscot they were found and were at times troublesome—now this is unaccountable —that this space of country which (although the *snail* would make very poor headway in at that time—would be hardly more than a good jaunt for a wolf *before breakfast* that these animals should be found at one side—and the other

not more than 150 or 200 miles—there should be none for forty years. I should think it not more than fifteen years perhaps not more than a dozen—but certainly not exceeding twenty—that the *first* wolf was seen any where about in this region during all this long period. Sixty years ago—when they were all decamping—there were no deers on the main land at all—they (the wolves) had killed them all: on the Islands they were found—plenty—which I cannot account satisfactorily for—inasmuch as I thought the wolf was a good swimmer. However that may be there were no deers but on the islands and there they were plenty—at that time although the two-legged wolves soon killed them all off—every one. The moose however which the wolves could not kill were very numerous—the forests were alive with them. Even the great depth of the snow in the winter did not enable the wolf to attack safely so formidable an animal. The Karabou too around the large heaths and lakes—were plenty enough but the wolves could not catch them; they did'nt think it worth while to try and so decamped. The deers began to come down into the country again from the north from twenty to thirty years ago and have been gradually multiplying till they are now very numerous and have been for several years—but it was some time after they came before the wolves seemed to find it out, although so little ways removed—but now they have become very numerous back in the woods and for five or six years are said to have been making great havoc among the deer. In the winter they may be seen it is said almost any day, in troops in the neighborhood of the lakes. They have not yet disturbed the settlements any—till this last summer they were said to have committed some depredations over in the provinces.

As to old Bruin I do not know that I can tell you any thing new—he is such a universal favorite—that his habits are pretty well known. In this climate he generally goes into a den about when the snows come in December—and stays till most commonly till April—sometimes however they come out for a little while—but I imagine not unless disturbed. The "den" is more generally a hollow log or in a hollow under the roots of a large tree, but they are not always thus choice of their winter quarters, for I heard of one that was found "snugged up" against the turned up roots of a windfall, and I was with a party once who started one out of his lair in a dense cedar swamp who had only made a *nest* apparently for the winter—he had been in it weeks then—in the deep moss on the ground. They are not always *torpid* or any thing like it but if they have a good chance to dodge out of their hole in season—will make off with all speed—this I have twice found to be so—whether they are ever so torpid as to be content to allow an enemy to come to the den—unless they be prevented by the snow from scenting or hearing him or have young I do not know. Stories however are frequently told of their dullness and genuine torpidity—when there was *no* difficulty in escaping. As to catching them, when found out, by use of snowshoes—I understand that cant be done—they will constantly be diving through the very thickest and most tangled swamp they can find—so as to make pursuit hopeless. There is one trick the bear has which I have never seen recorded which is to climb up in the beech trees—when full of nuts and getting into the top to draw the limbs to him to get at the nuts on the extremities—thereby breaking the limbs partly or wholly and leaving a knot of them up in the top of the tree. As we walk through the beech ridges—we see great

numbers on which this feat has been performed. Bruin is thought not to be remarkably bright and he does not seem generally to show to much advantage —perhaps the cubs, do not deserve their reputation. A friend of mine when a boy had a cub which exhibited some intelligence. After drinking its milk out of its little trough—it would always overset it of course, like a little pig—but the moment it saw any preparation for feeding it—it would run out into its pen and right the trough that no time might be lost—this shows considerable gumption for a cub.

As to the Foxes—I do not think of any thing which would be likely to be new to you, at present—Some years ago the Red-fox was almost the only one found here—the cross was rare; not more than one in thirty, I feel confident—from the collections which would be made by the traders—The silver gray or black was rare indeed—Hundreds might be seen and not one of them. But of late years the last two kinds have so much increased relatively that as I should judge, one out of four or five was a cross—and the silver-greys are not uncommon—These last are a good deal larger than the red and not nearly so shy or cunning—There is some obscurity in the account of the different species of fox; and I have not time to mention any thing which has come under my observation concerning it.

The *Skunk* is a new comer in this region fifty years ago an old Indian was showing my father the skin of a strange little animal he had killed away up in the Provinces. He had made a pouch of it—none of the Indians had ever seen any thing like it. They gradually came into this country from two directions about twenty years ago—at about the same time—in one direction from the west—and the other from the old settlements in Canada, down by the St. John's River or that direction. I have now time to speak of only one other little animal—that a very small one too—a fox colored mouse found in the beech woods —which I have never seen described in books concerning the zoology of N. America. I have seen however some lines by an English authoress Mary Howit "To a Wood-mouse" in which one very like this is described. It lays up a little store of nutts in the winter—shelling them very neatly—these the boys sometimes rob.

You may be interested to hear from some of our old companions to Labrador. Capt. Emery died in W. Indies of yellowfever six years ago. Swett, one of the hands, the only one I have heard of since was lost at sea about 12 years ago. Coolidge is at Eastport doing little I believe in the way of trade. Ingalls and Shattuck I suppose you have seen since I have. The "Ripley" laid her bones at Bay Chaleur wrecked.

I hear by the papers that John has gone to England. Give my best respects to the other members of your family. The reminiscence of our voyage to Labrador is now exceedingly pleasant to me. I would I had time to recall some of it to your mind—but must close for this time. We are all well—*those of us who are left.* My mother—my sister Mary and brother Benjamin have gone before us to another world—my Father still lives and is in good health—except that he is *very* lame—He cannot walk—but is moved about in a chair on trucks—though he manages to ride out every pleasant day. I should rejoice to hear that you are all well—Will you do me the favour to answer this long defered letter and believe that I am truly

Your friend Thomas Lincoln

P. S. I shall try to muster up some farther facts concerning our quadrupeds and send to you—I hope to be able to soon—Unless you shall tell me that they are of no value at all.

T. L.

Write to me if you please—if for nothing more, to let me know that this has not miscarried as well as the other.

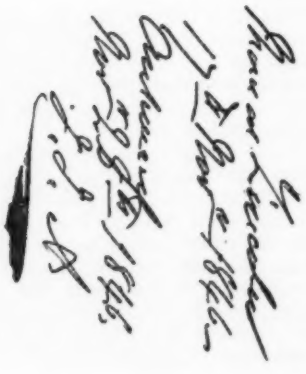
Dan T. L

Dennysville Me / Nov 21 / Paid 20

John J. Audubon Esq

New York

N. Y.



NOTES ON THE FEEDING HABITS OF THE LITTLE BROWN BAT (MYOTIS LUCIFUGUS)

By H. H. Pittman

[*Plate 23*]

Bats are not very plentiful on the prairie of southwest Manitoba, partly, perhaps, on account of the lack of suitable sleeping and hibernating places, for most of the houses are bat-proof and other buildings single-boarded. Trees, of course, large enough to provide accommodation for these mammals, are not very numerous except along the banks of the Souris River and in some of the older wind-breaks.

The commonest species on this part of the great plains is the little brown bat (*Myotis lucifugus*) and a short time ago we had an opportunity to study the feeding habits of this tiny creature under rather favorable conditions. We had two specimens in captivity, one, a normal healthy male and the second, a light-colored female, so pale that it approached the subspecies *pernox* of Hollister. They were kept in a large box with mosquito-netting in the front and allowed occasional liberty in a screened-in porch. Both gradually became accustomed to the changed conditions and the male, particularly, quickly learned to associate certain sounds with feeding time.

They were offered flies and various other insects but preferred the noctuid moths which at the time were very plentiful. They would readily take these from our fingers but as a rule we introduced them into the cage through a small hole in the screen.

The invariable habit of a little brown bat, whether in the cage or at liberty in the porch, was to seize the moths savagely and then settle right-side-up on the nearest rough surface. Here the body, dropped wings and interfemoral membrane were used to form a pocket or pouch and the insect transferred to it after being rapidly rubbed several times down the animal's chest. When in the pouch the insect was quickly bitten at once or twice, whether to kill it or in an attempt to get hold of the head, it was impossible to say, and then brought out and eaten head-first, the wings dropping off as the animal fed. This practice never varied. Even if a crippled moth was placed on the floor of the cage it was picked up and treated like an active healthy one.

When the bats were fed regularly and frequently, eight or ten moths constituted a meal, after which they would ignore the most tempting insects for a time but in less than half an hour they would start again.

They could handle moths as large as the red underwing but of these they would not eat so many. They would drink readily, preferring to lap water trickling down the wire of the cage.

The impression of several observers was that the bats, at least when in the cage, did not locate their prey by eye but by ear. Perhaps the curious tragus catches the air vibrations caused by fluttering wings. Anyway a hungry bat would pass right by and sometimes almost over a resting moth without noticing it.

The daytime was spent in sleep, apparently, but as the light failed their activity increased until by dusk they were ready to eat and for a long time our evening task was to draw the moths with a light and then sweep the windows with a net. Years ago, near Boissevain, in Manitoba, I found that bats of this species used to sleep in a wooden pump in daily use, resting inside just above the spout through which they entered.

Bats move quickly and the rapidity of every action made it necessary to observe the same thing several times before it could be understood.

Wauchope, Saskatchewan, Canada.

Little brown bat feeding. The moth is just being withdrawn from the pouch formed by the interfemoral membrane.

The animal has just placed a moth in the pouch formed by the interfemoral membrane and is biting at it. One of the few instances in which the wings were not placed close to the body to lengthen the pouch or pocket.

LITTLE BROWN BAT (MYOTIS LUCIFUGUS)

(Pittman: Little Brown Bat.)

UNIV. OF MICH.

SOME DETAILS ON THE LIFE HISTORY AND BEHAVIOR OF NAPÆOZAPUS INSIGNIS ABIETORUM (PREBLE)

By L. L. Snyder

During the past few summers I have occasionally met with jumping mice in various parts of Ontario but in most cases have had only a fleeting glimpse of the animal as it disappeared into some cover. On three occasions the observations have been of sufficient duration to determine the species, but more often I was merely aware that what I had seen was a jumping mouse making wild and lengthy leaps in front of me.

Although my observations indicate that these mice are more active at night, I have occasionally seen them at various times during the day. It is possible that this may be accounted for entirely by the fact that the animal was frightened from a retreat by my approach.

Napæozapus insignis, the woodland jumping mouse, as the common name suggests, is to be found in wooded areas but the immediate habitat of the species is somewhat variable. Undergrowth seems to be essential although its home may be only adjacent to such cover. It appears to prefer the vicinity of clearings and the banks of streams, not the dark interior of heavily forested areas. In such a setting one must indeed be favored by fortune to observe any part of the normal activities of so small an animal which possesses such surprising powers of removing itself from one's proximity.

While in camp on Lake Nipigon, Ontario, during the summer of 1923, I was able to make observations that might be difficult to duplicate unless by chance. Our camp was situated on a small knoll, sparsely sheltered by young balsam firs and white spruce. The knoll, about sixty by one hundred feet was a sort of "island" where the trees had been left standing in making an elongated clearing for the fishing village of Macdiarmid. The dense woods were about one hundred yards to the west and east of its center but considerable "slash" had grown in the openings. A spring was convenient to the camp site, being about sixty feet south of our tent. Other more or less permanent water holes could be found beneath the maple shrubs that bordered camp on the west and south. Where the tent was staked there was no undergrowth or debris, the gently sloping ground being carpeted with conifer needles, but wild sarsaparilla (*Aralia nudicaulis*) and bunchberry (*Cornus canadensis*) grew here and there in the untrodden places.

About midnight on the night of June 16–17 (1923) my wife called my attention to a thumping against the canvas of our tent wall. As a lantern

was burning in the tent I thought at first that insects had been attracted to the light and that a toad was hopping against the wall to secure them, but on second thought I noticed the action was too rapid for that of a toad. Securing a flashlight I stepped out the front of the tent into a screened-in portion (where we had our meals). A small object could be distinctly seen jumping rapidly up and down, against the canvas and away from it. Not until it leaped away beyond my vision did I realize that it was a jumping mouse. In a moment it could be heard returning, this time with short quick jumps. It came from behind the tent and toward me to a spot within three feet of where I was lying prone. In an instant it had disappeared into a small hole near the first tent stake. This puzzled me as I was positive there had been no opening at that place previously. Hastily securing another flashlight (the light not disturbing the mouse in any way) I returned to my post and for more than an hour watched the mouse make trips to and from the hole. It was carrying into the hole some material which it had secured back of the tent. As nearly as could be ascertained the material was carried in the mouth and seemed to be supported by the front feet. While the animal was laden its jumps were short and slightly labored, being not more than two feet in length, but after it emerged from the hole one leap usually carried it to the end of the tent, which was seven feet long.

Twice during my watch the work was suspended for a brief period while the mouse went through the curious "dance," which had originally attracted our attention. There did not seem to be the slightest motive for this performance. Its movements gave one the impression of a rubber ball fastened to an elastic band being bounced carelessly up and down, here and there.

Finally the mouse ceased its activities and remained in the hole. I retired, marking well in my mind the exact position of the opening in the ground. The next morning I hastened to examine the spot; not the slightest trace of an opening was evident. This then is one reason why the nests of jumping mice are not more frequently detected, for I had concluded that nest building was the operation that had been observed.

Subsequent nights yielded nothing, and the spot where the opening had been seemed undisturbed. It occurred to me that this might be a storehouse for food and that the mouse had abandoned the place for the present. Not wishing to excavate too hastily, however, I delayed operations until the afternoon of July 3.

Equipped with paper, pencil, tape and camera, Mr. J. R. Dymond and myself started excavation. By probing the ground near the tent stake

we discovered a spot which seemed soft although the surface appearance was not different from that of the rest of the area. This spot proved to be the entrance to the tunnel. The tunnel was found to have a very

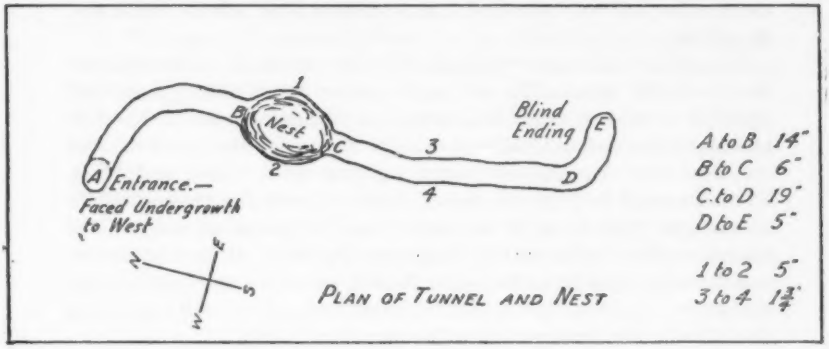


FIG. 1

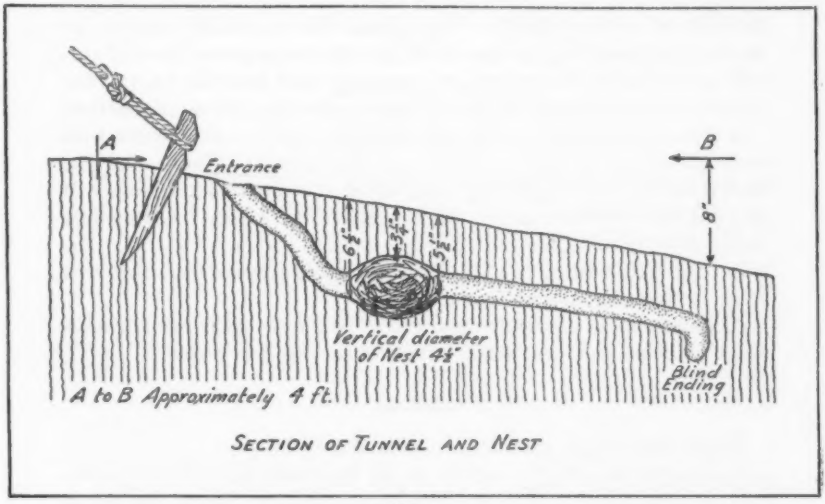


FIG. 2

gradual descent and to follow a semicircular course. At a point fourteen inches from the opening the dry leaves of a nest were seen. Uncovering the nest, we proceeded cautiously in the hope of catching the adult

mouse, but with one leap it cleared the nest and before we could give chase had reached the shelter of the shrubs forty feet to the west at the foot of the knoll. The course taken by the fleeing mouse was direct and unwavering and we estimated that it cleared from ten to twelve feet at a jump.

Returning to the nest we found it to be composed of the soft dry leaves of wild sarsaparilla and aspen poplar, entirely filling a rounded chamber in the tunnel which measured six inches long, five inches wide and about four and one half inches high. Removing the top of the nest we discovered five sluggish young jumping mice, naked and blind. They appeared to be about one week old. Examining them carefully we thought them to be of the rarer species *Napæozapus insignis*, the extensive white tip to the tail being very apparent. It is of interest to note that the white tip at the end of the tail, one of the most conspicuous characters by which this species is distinguished, is so well marked at this stage in the development of the immature young.

Continuing excavations we found that the tunnel extended past the nesting chamber for nineteen inches where it turned to the left and then downwards, ending blindly. Throughout this extent the tunnel ran about parallel with the surface of the ground, being about five and one-half inches below the surface. It was suggested that this part of the tunnel might have been continued later for the purpose of hibernation.

A close examination of the nest revealed that it was infested with fleas (preserved but have not yet been determined). The tunnel was then filled in and a "lightning" trap set at the entrance in the hope of securing the parent to prove the identity of the young. Fortunately under cover of darkness, the female returned and was caught in the trap. (It is interesting to note that she did not attempt to return even to her young until late at night).

Examination of the adult proves it to be *Napæozapus insignis abietorum* (Preble), the form characteristic of the Nipigon region.

SUMMARY

These observations show that in this case at least:

1. *Napæozapus insignis* carries on its important activities at night.
2. A litter of five naked and blind young is born during the last of June or the first of July in the latitude of Lake Nipigon.
3. The young are born in a nest made of dry leaves and situated in a chamber beneath the ground, the chamber being an enlargement of a shallow tunnel.

4. The tunnel entrance is closed during the day, at least during the time of nest building and when the young are in the nest.

5. No surface evidence such as a runway gives a clew to the nest location.

6. The naked young can be determined as belonging to *insignis* by the white termination of the tail, this marking being over one half of an inch in extent.

7. When alarmed the animal makes rapid jumps of from ten to twelve feet but during normal activity the jumps are shorter and more deliberate.

8. The animal is parasitized, at least in the nest, by fleas.

9. *Napæozapus insignis* has been observed performing an eccentric "dance" which is not necessarily linked with rut since it was observed on the night of June 16–17 and young were taken from the nest sixteen days later.

Royal Ontario Museum of Zoology, Toronto, Ontario.

RECENT OBSERVATIONS ON THE NORTHERN ELEPHANT SEAL

By Laurence M. Huey

(*Plates 24–27*)

Much has been published regarding elephant seals, of which there are two known species—*Mirounga leoninus*, found on certain islands in the extreme South Atlantic, and *Mirounga angustirostris*, now confined to Guadalupe Island, off the west coast of Lower California, Mexico. It is with the latter species that the present paper deals. Such eminent writers as Capt. C. M. Scammon, Dr. C. H. Townsend and others have had intimate acquaintance with this beast and their observations have been well recorded. However, the greater part of the life history of the animal still remains a mystery—especially that part of its life which is spent at sea.

As is generally known, the species was on the verge of extinction as long ago as the early eighties, and it has been only the extreme isolation of its habitat that has prevented its complete extermination. It was, therefore, a great satisfaction to all of those interested in wild life, that an expedition, coöperated in by the National Museum of Mexico City, the Mexican Fisheries Department, and four American scientific organizations, which visited Guadalupe Island in July, 1922, returned with

information that the island had regained its population of elephant seals to the number of 264 animals. These were believed to be mostly males, the females being absent and their whereabouts unknown.

One year later, as a representative of the Natural History Museum, San Diego, I was privileged, through the courtesy of the Mexican Government, to join a party making a short visit to Guadalupe Island. On July tenth, 1923, we started from San Diego aboard the Mexican fisheries' patrol boat "Tecate," and on July thirteenth arrived at the northeast anchorage, Guadalupe Island, where we stayed until the morning of July sixteenth. At an early hour on that day we set sail for the elephant seal beach, which is located on the northwest part of the island. The day was gloriously clear, with a quiet sea, and we made a successful landing through the surf without disturbing the beasts.

A count of the animals on the beach that was immediately made by different members of the party revealed two individual counts of 224 and one count of 225, though many seals were in the water at the time and could not be checked. All proved to be adult or nearly adult individuals, excepting five yearlings of which the sex was undeterminable. Later in the day I counted the entire herd, which was then at rest (there being none in the surf), and I made a grand total of 366—all of them except the five before mentioned being large animals.

The most impressive feature of these animals was their enormous size as they lay packed closely together, sunning themselves on the beach (fig. 1). Of two specimens which, by special permission from the Mexican Government, were killed, the larger measured 4 m. 430 mm. (14 ft. 6½ in.) in length and had a girth of 3 m. 320 mm. (10 ft. 10¾ in.) at the back of the base of the front flippers. This specimen, which went to Mexico City, was one of the largest seals on the beach. The other specimen, but slightly smaller, was taken for the Natural History Museum of San Diego.

The oldest animals were of a yellowish-brown color. The younger seals, comprising at least one-third of the herd, though nearly adult size, were of a grayer cast and the proboscis was smaller. This snout, which is so well developed in the adult male, and which gives the animal its name, was the source of a great deal of interest. I had the task of skinning the better part of the two huge animals, and I took particular interest in this section of their anatomy.

Dr. Townsend states that the elephant seal does not inflate its trunk and, while I found that a greater part of the organ was flesh and tissue, there were two large, internal chambers at the end of the cartilag-

inous structure of the nasals, that definitely showed signs of being capable of a limited inflation and deflation at will. In the dead animal the membrane forming these chambers was decidedly wrinkled and of a soft texture capable of expansion. I have photographs taken of the animals showing them with their noses apparently bulged out on top with inflation (fig. 2).

By far the most interesting feature of the nose, however, was found after the skin had been removed from the skull. In the cartilage on the bridge were two large valve-like flaps, one working in either channel of the nostrils, which could be raised and closed at will by the animal. These organs gave it the power to make the snoring noise so characteristic of the elephant seal. I tried to save this cartilage when preparing the skulls upon my return to the museum, but it was found to be impossible, for it disintegrated in the process of cleaning.

A yearling elephant seal which was captured during the expedition and placed temporarily in the zoo, San Diego, prior to transfer to Mexico, gave me an opportunity for close observation and I paid especial attention to the functions of the nose. When submerging in the pond, the seal would close its nostrils with a definite action, making them air-tight and water-proof. It would thus appear that, in the younger animals, the nostrils are contracted for the purpose of excluding the water. In the older seals, however, when the proboscis is nearly or fully developed and the end has greatly widened, the muscles of the nostrils seem to have lost their ability to contract and the internal cartilaginous valves are probably used for this purpose.

While looking over the herd, I noticed a peculiar white mucus exuding from the nostrils of all the animals that had not been disturbed. This same thing was observed in the case of the captive seal in the zoo and I am unable to explain the reason. If it had occurred with only a few of the animals, one would suspect a disease, but it seems unlikely that disease could have involved so many of the herd. This discharge was the cause of considerable annoyance, as it caused hordes of flies to congregate, which noticeably distressed the seals.

After dissecting the first animal, I carefully watched some of the large seals exhaling their breath, and they were definitely seen to make their peculiar snoring sound by an action of their noses. This sound was made only when the animal was raised up on its flippers or was alert and wide awake. I noticed that when they were lying at rest, prone on the beach, the breath was released with one great, noiseless puff. In several instances I saw depressions a foot deep blown in the sand where the beasts had been undisturbed for some time (fig. 3).

A number of beach habits of these animals were of great interest, and I could have spent hours watching them had I had the time to do so. I was quite impressed by the way in which, when leaving the surf, they would, as soon as they came to rest on the sand beach, hold their back flippers apart, getting all possible assistance from the onrushing waves, to help push their huge bodies up the beach—thus giving one the impression of their being extremely lazy animals. After getting beyond the help of the waves they would amble up the beach in a slow motion, humping themselves along like large, fat caterpillars. The undulating motion of their blubbery backs traveled from tail to head like a breeze over a grain field.

In a great many cases, after the animals had settled themselves on the beach, they crossed their hind flippers in much the same manner as a man crosses his knees when perfectly at ease in a comfortable chair. This habit was also observed in the case of the captive animal in the zoo, when it "hauled" out of the water and lay at rest in the warm sunshine.

About noon of the first day I set up my camera and cautiously walked through the sleeping herd, searching here and there for animals in the position I wished to photograph. In one instance I had opportunity to study the action of the front flippers, for the seal under observation was rolled on his side, leaving both flippers free. These he used in the same way as a person would use his hands—scratching his face, side or any part of his body within reach, brushing the numerous kelp or blow flies from his face, or throwing sand over his back (fig. 4).

It so happened that all of the older animals were shedding their coats at the time of our visit and I found that the throwing of sand was apparently done to relieve the itching of those parts of their backs that were out of reach of their flippers, and also to protect the tender new skin from the torrid rays of the sun. The cuticle is shed with the hair and I found pieces as large as my hand scattered over the beach. The freshly uncovered skin was a bright pinkish hue and gave the beast the appearance of a newly sun-burned bather—which indeed he was!

When the herd was disturbed, fights among the seals were numerous. The animals nearest the approaching person would try to back out of the way and thus come in contact with a sleeping neighbor, who, aroused from his slumbers, would show signs of anger. They seldom attempted to defend themselves against a human intruder, but would open their cavernous mouths and retreat backward down the beach or through the herd to the surf, never losing sight of the person disturbing

them until within reach of the water. One of these clumsy beasts backing away was a laughable sight, and many of them, I must admit, were sent to sea merely for our amusement.

The necks of most of the older males were scarred deeply with slashes. Some of them were raw and festering at the date of our visit. Two large males that aroused special interest were seen fighting for fifteen or twenty minutes, the trouble starting when they were disturbed by members of our party on the beach. The fight continued down the slope into the water, and finally ended when both seals swam out in the surf. They proved very awkward combatants and struggled at each other and reared up as high as they could on their front flippers, trying all manner of maneuvering to get an advantageous position for striking. The softer part of the trunk was apparently the main objective, for great damage could have been done if one or the other could have seized his opponent by this soft organ. As I searched around among the herd I saw several with disfigured noses, no doubt due to combat. When fighting in the surf they maneuvered for position with considerable dexterity, trying to obtain the advantageous position of being to the seaward and thus getting the benefit of the inrushing waves to hurl the huge body forcefully against the opponent.

The food of these animals still remains a question. In the first specimen examined, the stomach contained only a double handful of sand and rocks, numerous large stomach worms about two inches in length and a small piece of kelp. The stomach of the other specimen contained, in addition to a pint of rocks, sand and stomach parasites, part of the beak of a squid—thus providing a single clue to the food of the elephant seal in a wild state. The captive specimen in the zoo was given fresh fish, which it devoured greedily—taking ten to fifteen pounds a day.

In Doctor Townsend's account, published in Zoologica, volume I, number 8, he illustrates by photographs the extreme difference in the skulls of the two species of elephant seals, but he does not give a detailed description of either. Herewith are photographs of the skull of the larger specimen of *Mirounga angustirostris* which we took. Its weight and measurements are as follows: Weight, 10,418,625 grams (22 lbs. 15½ oz.); total length, 556 mm.; greatest width at jugals, 315 mm.; width of rostrum near end, 116 mm.; length of right nasal, 81 mm.; left, 83 mm.; greatest depth of skull including the jaws in their natural position, 291 mm.; height at the base of the cartilaginous septum, which was lost in cleaning, from the projecting ends of the nasals to the nearest bone directly beneath, 104 mm.

An irregularity exists in this specimen, whether due to deformity at birth or to an accident during the juvenile life of the creature I could not ascertain. This deformity is especially noticeable in the posterior parts of the parietals, where a 17 mm. variation in length occurs.

Natural History Museum, San Diego, California.

FIG. 1. The most impressive feature of these animals was their enormous size as they lay packed closely together.

FIG. 2. Elephant seals with noses bulged out on top with inflation.

NORTHERN ELEPHANT SEAL

(Huey: The Elephant Seal.

UNIV. OF MICH.

FIG. 3. Depressions a foot deep are blown in the sand below the nose.

FIG. 4. He used his front flippers as a person would his hands.

NORTHERN ELEPHANT SEAL

(Huey: The Elephant Seal.)

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FIG. 5. Uncleaned skull showing cartilaginous valves in nostril. Much reduced.

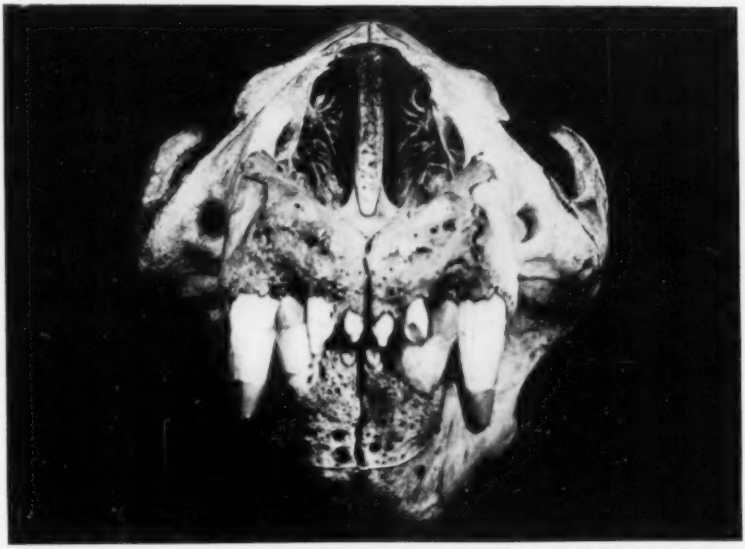

FIG. 6. View showing median septum after removal of cartilaginous valves. Much reduced.

NORTHERN ELEPHANT SEAL

(Huey: The Elephant Seal.)

UNIV. OF VIRGINIA

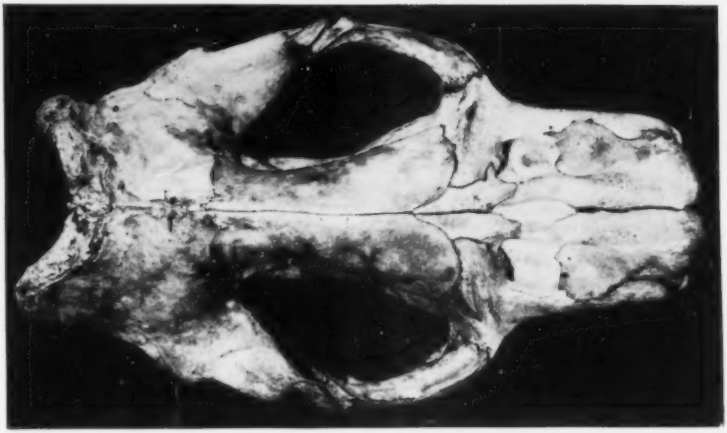

FIG. 7. Dorsal view of skull showing irregular shape of right parietal. Much reduced.

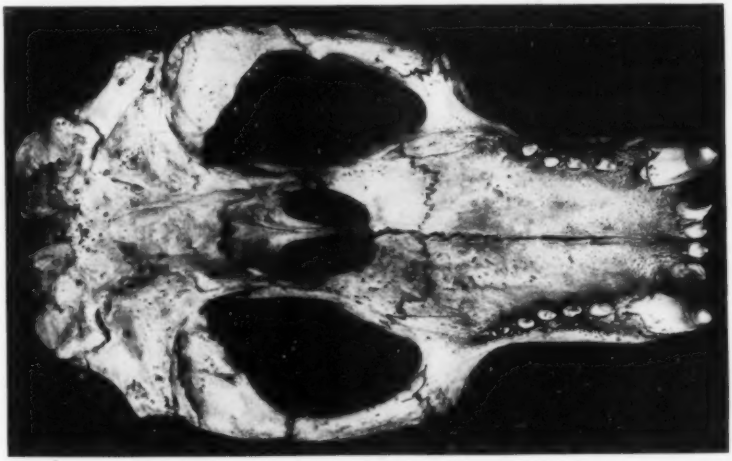

FIG. 8. Skull of adult male, ventral view. Much reduced

NORTHERN ELEPHANT SEAL

(Huey: The Elephant Seal.)

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REARING HIPPOPOTAMUSES IN CAPTIVITY

By C. Emerson Brown

The hippopotamus breeds readily in captivity, but in many cases it is somewhat of a proposition to raise the young successfully. In the Philadelphia Zoological Gardens there have been four of these valuable animals born, three of which are now living, the other having been killed by its mother when only twenty-one days old. I do not believe that she did this intentionally, but rather through her over-anxiety for the safety of her young.

The old pair came to the garden in June, 1912; and they were at that time about eighteen months old. Their weights were 605 pounds for the male, and 655 pounds for the female. They lived together until 1917 or about five years without signs of breeding, and were about seven and one-half years old when the first young was born. At about the same time that the young was born both the old male and female shed their large three-crowned deciduous molars. The gestation period for the first young was 243 days, the second 241 days, the third 235 days, and the fourth 234 days.

In giving birth, the female stood up, and when the young was delivered it was suddenly shot out to a considerable distance into the water. The first young was born in July, 1918, and was a male. He at once began to move around and in five minutes after birth was walking about in the shallow water. He stood about eighteen inches high, was about three feet long, and weighed about 60 pounds (estimated). His skin was a dark gray, a little darker than the mother, and very much wrinkled. He was successfully raised as follows:

About a month before the expected birth, the tank, which is about four feet deep, was built up with heavy timbers and plank so that the floor was about twelve inches below the water line. This, by eliminating the steep incline into the tank, gave the animal much more room and a direct walk out onto the dry platform. The water would not then cover the female, consequently, to prevent her skin from cracking she was sprayed twice daily and a considerable quantity of fresh water spurted into her open mouth, which she seemed to enjoy immensely. The house was closed to the public June 15th; the baby was born at 5:30 a. m. July 1st. The mother was very nervous, would not allow anyone to approach the tank, and kept the young well hidden behind her, pushing it into the required position with her ponderous nose.

For a month the water in the tank could not safely be changed, for if it was lowered even the least bit, the mother immediately showed signs of extreme nervousness. These nervous spells were frequent, often coming on during the night, and for this reason a keeper was retained on duty night and day for the first two months. The young nursed seven or eight times during the daytime, always *under water*. When the mother came out of the tank to eat, the little one came out also, and, when she had finished eating, if he did not follow her into the water immediately, she would push and tumble him about, sometimes with open jaws that threatened at any moment to kill or injure him. As soon as he was in the water again, she seemed contented and would often nurse him immediately. After about four weeks her nervousness seemed to abate, the danger from this source seemed to have passed, and she allowed the youngster to remain out of the tank alone.

The young one was very playful at all times and in a month, when we raised the depth of the water to eighteen inches, he amused himself by diving and playing a great deal. He generally slept with his head resting on his mother's head or neck. The false floor was removed from the tank August 19th, and the mother and young allowed the full depth of the water which is about 4 feet.

On April 1, 1919, the young was eating solid food and nursing very little, but about April 15th was again nursing and not eating. In a few days he passed several worms which proved to be one of the ascarids. He was then given one tablespoonful of turpentine mixed with a little ground bread and rolled oats and seemed to improve at once. On April 9th, mother and young were turned out of doors for the first time. On November 1st, the young one was separated from the mother and the old pair put together again.

On December 8th, 1920, the second baby was born. It was also a male and the mother seemed much more nervous than with the first one. No false floor was built in the tank this time, but only twelve inches of water were run into it. This left rather a steep incline for them to negotiate every time the female came out to feed and apparently this seemed to worry her for fear the young would in some way become injured. In her excitement she would sometimes throw him down the entire length of the incline and finally, during the night, she accidentally caught him on her sharp teeth, and killed him.

The third one was born February 4, 1922, and was also a male. A false floor was again built into the tank as in the case of the first, and, while the mother used him more or less roughly, she did not injure him

in any way. We retained the keeper on duty day and night, as with the first one, for two months as we feared that the young animal would meet the fate of its predecessor. If the keeper spoke to her and detracted her attention from the young for a while she would soon become quiet.

In addition to the trouble we had had with the previous young ones, we were obliged at this time, it being very cold, to keep the temperature of the water up to 70 degrees. To do this it became necessary to add more hot water on the second day after birth, and raise the water to about 18 inches, or until it overflowed the tank. Then by turning in the hot and cold water to the right temperature we succeeded in running it in as fast as it went out and by so doing managed to keep the water warm and fairly clean. This method of cleaning was continued for over two months until the weather became warm enough to turn the mother and young outdoors into the outside tank, and then their breeding tank was thoroughly cleaned and scrubbed.

The last male was born January 2, 1924, and is rather more husky and active than any of the others. On the seventh night after it was born the mother for the first time became very nervous, and the keeper noticed that there was some outside noise that frightened her. It was then decided to place lights in the building so that when she became excited or frightened, she could easily see the young. After doing this, we had no further trouble and she showed no more signs of nervousness. The tank and all other arrangements were the same as in the case of the first born. The young nursed within three hours of the time it was born.

The first specimen born here was sold to the Boston Zoological Garden. The second was accidentally killed. The third was sold to Mr. Ellis S. Joseph, an animal dealer of Australia, who disposed of it to the Cincinnati Zoological Garden. The fourth is still with its mother at this time.[1]

These animals are fed rolled oats and bran (a half and half mixture) also chopped cabbage, potatoes, lettuce, and bread. They are also given plenty of good, clean hay, but for the first two or three months after the birth of the young the hay is always chopped fine. The reason for this is that the young is continually nibbling and would be likely to get long hay into its stomach, which might ball up and cause trouble.

These animals have been successfully raised in other zoological gardens and, perhaps, with much less trouble, but their extreme scarcity

[1] This one was killed by the mother since the above was written.

in this country at the present time makes them so valuable that one cannot take too many precautions to insure their safety. Importation laws are becoming more rigid and wild animals scarcer and harder to secure.

Consequently, it is up to the Zoological Gardens to breed all that they can for sale or exchange with other gardens.

Philadelphia Zoological Garden.

MAMMALS OF THE GASPÉ PENINSULA, QUEBEC

By George G. Goodwin

[*Plates 28–29*]

During the latter part of August and the early part of September, 1923, I was engaged in collecting mammals in the Gaspé Peninsula, in the region of Mount Albert.

Almost nothing has been published on the mammals of the Gaspé and the only references to the fauna appear in sporting papers and publications dealing with the geology of the region. A report on my collection, therefore, may add something to our knowledge of the mammals of eastern North America.

Leaving New York on August 13, 1923, I arrived in Montreal late in the evening, and was met by my brother, Douglas Goodwin. He generously contributed the use of his automobile and was with me during the trip to Mount Albert; he proved most valuable as a scout in the absence of a guide. A day was spent in overhauling and packing equipment and supplies on the car for the long journey east to Ste. Anne de Monts.

Our route lay along the north shore of the St. Lawrence River to Quebec. Here we crossed on the ferry to the south side of the river and proceeded along a dirt road on the north shore of the Gaspé, camping at nights by the roadside.

Ste. Anne was reached in the evening of the third day after we left Montreal. At this place the baggage was transferred to a wagon for transportation into the interior. Later I was compelled to pack the equipment on a stone-boat drawn by a horse so as to get it safely over the swells of ground and fallen trees. Finally even this conveyance had to be discarded and we made the rest of the journey to Mount Albert, on foot, carrying our equipment.

The Gaspé Peninsula is in the extreme eastern part of Quebec, south of the St. Lawrence, and is bounded by the bay of Chaleur on the south. It has an area of about 11,000 square miles and lies entirely within the Canadian zone. The peninsula is covered largely with primeval forest and is almost roadless, except along the shores. No roads pass from north to south on account of the chain of Shickshock Mountains, which are far too rugged to be crossed There is a fringe of settlements along the north coast which depend for livelihood mainly on fishing in the summer and lumbering in the winter. Most of the inhabitants cultivate a few fields and do a little farming, using oxen and old-time farm implements. Only the coast region, for a maximum depth of ten miles, has opened up to settlement.

The north shore is particularly striking on account of the greater number of huge bowlders scattered about. The bowlders are probably derived from the north shore of the St. Lawrence and transported hither by ice. These bowlders were not found at altitudes much above sea-level.

Bell and Chalmers[1] conclude that the Labrador ice sheet did not cross the high regions of the Shickshock range but divided into two lobes at the west end of the Gaspé Peninsula and passed on either side, meeting south of the range and continuing again to form one great ice field.

About half way down the peninsula lies the small village of Ste. Anne de Monts. It depends chiefly on the lumber trade, its spruce and balsam furnishing most of the logs that are brought down the Ste. Anne River, which joins the St. Lawrence at this point. Here and there are a few good farms with fields reaching into the forest some three or more miles.

Though my collecting was done mainly in the vicinity of Mount Albert, I spent some time collecting two miles inland from Ste. Anne. Camp was pitched on the bank of the river just at the edge of the spruce forest, where the ground was rocky and the trees stunted. The Shickshock Range could be seen faintly in the distance; a sweep of open undulating country spread out northward to the sea. Surprising crops of grain and hay are raised in the valley, where they are sheltered from the raw winds and fogs of the St. Lawrence. However, these favored spots are scarce and but little land is available for farming. The forest is a dense growth of spruce, birch, and maple, damp and dark. The

[1] Coleman, Geol. Surv. Canada, Bull. no. 34, p. 12. 1922.

fogs that extend a little inland probably account for the stunted condition of most of the trees of this neighborhood.

At the time of my stay the weather was cold and bleak; the wind blew as it does on a blustering March day of the countries farther south. A week was well spent here, in spite of the weather, and my collection of over sixty specimens from this place included nineteen species.

On August 27, we broke camp at Ste. Anne and moved up the trail toward Mount Albert, passing through spruce forests and groves of birch and poplar trees. The trail lay along the west side of the Ste. Anne River, leading south ten miles to the Shickshock Range, thence east along the foot of the mountains. The Ste. Anne River is very swift, carrying a considerable head of water, and is unfordable. The current has carved its way through deep curving valleys of wild appearance. After two days along a trail which became too rough to travel with a horse, we stopped at a place where fallen tree trunks covered the ground in inextricable confusion.

After making camp on the edge of the river about a mile from the mountains, I ran out a line of traps along the river bank for four miles, and also up a small stream. The forest near this camp was particularly dense and damp and extended on all sides, completely obscuring all view of the surrounding country. So great was the moisture that not only was the ground bedded with deep moss, completely burying many fallen trunks, but the trees themselves were draped with hanging moss. Off the trail travel was most difficult and heartbreaking.

The only interesting feature at this locality was the fishing. The bold leaps of salmon as they came up the river were a sight to be remembered. Using a light trout fly-rod, I was able to land a few of these big game fish, and some big trout and black bass were also caught.

Mammal collecting here was very disappointing. After five days I had secured forty specimens, the most common species being the white-footed mouse. These little creatures swarmed everywhere; they jumped off the trees onto the tent and skated down the side; they got in our beds and food and into most of my traps. I left a big pile of them on the shore and brought home only part of the catch.

From here to the foot of Mount Albert is about ten miles but it took us a day to get there. The surface of the country is a jumble of rough mountains, irregular steep ridges, hills, valleys and ravines. The trail was constantly barred by fallen trees. The last camp was made at the foot of Mount Albert a short distance from the forks of the Ste. Anne River.

Mount Albert, or M'Albert as the French Canadians call it, is one of the lofty peaks of the Shickshock Mountains. It is a steeply walled table-land a few miles square, covered with a weathered mass of brown serpentine. The summit is 3,660 feet above sea-level and quite bare except for a scanty covering of grass in sheltered places. There was a little snow in a ravine and evidently this snow lasts the year round. Looking southward from the summit of the mountain one sees Devil's Lake in a wide valley below. Beyond, as far as the eye can see, stretches an unbroken forest covering successive mountain ridges. Ten miles to the east can be seen the bare peaks of Tabletop Mountain, with a large forested valley between. Mount Albert has timber almost to the summit on the north and east sides, but the trees growing above 2,000 feet are too small for lumbering. For the last quarter mile to the top the trees are stunted and so dense that in places it is impossible to force a way through.

Traps which I set round the little ponds and along the small streams on the table-land caught only a few specimens of *Microtus*. Traps were set also near the foot of the mountain and on the larger streams, as well as up to and beyond the forks of the Ste. Anne River. There is a sixty foot water-fall on the south branch about a mile beyond the forks. I spent two weeks in this vicinity where a hundred specimens were secured.

There evidently are caribou on the mountains, though I did not see any. My time was too short and the country too rough to permit me to secure specimens. I was told that black bear had occasionally been seen and also moose, but they are very rare now.

The collection made at Mount Albert is typically a woodland series and contrasts with the specimens secured at Ste. Anne de Monts, where comparatively few forest-dwelling animals were secured.

Species typical of Mount Albert	*Species typical of Ste. Anne de Monts*
Sorex personatus	*Condylura cristata*
Sorex gaspensis	*Microsorex hoyi*
Neosorex p. acadicus	*Blarina b. brevicauda*
Mustela cicognanii	*Microtus p. fontigenus*
Mustela vison	*Ondatra z. zibethica*
Peromyscus m. abietorum	*Zapus h. hudsonius*
Evotomys g. gapperi	*Marmota m. canadensis*
Napæozapus i. insignis	*Tamias s. lysteri*
Sciurus h. gymnicus	
Lepus a. struthopus	
Rangifer c. caribou	

In addition to the two hundred mammals taken north of the Shickshock Range, a collection of one hundred and ten specimens from the southern interior of the Gaspé has been kindly contributed to the Department of Mammals by Mr. Childs Frick. The region where this collection was taken has not been explored to any great extent, probably due to the difficulties of travel. With this collection and the one from the Mount Albert expedition, I have a unique series of small mammals from Ste. Anne de Monts on the north coast to Chaleur Bay on the south.

MR. FRICK'S ITINERARY

On August 18, 1921, Mr. Frick started on a trip up the Cascapedia River, making a collection at intervals from the coast to Loon Lake on the head-waters.

According to Coleman,[2] the Cascapedia River has a well-graded channel rising in thirty-six miles from sea-level to about four hundred feet, an average of eleven feet per mile, and scows carrying several tons of supplies for lumbermen operating on the head-waters are hauled up by teams walking on the beach or in the shallow water. The river valley is in some places wide, with considerable areas of good alluvial land, covered with hardwood, but in other places is narrow and V-shaped. Re-entrant forms are often striking, and for most of the distance the valley is entrenched several hundred or a thousand feet beneath the level of an uneven table-land.

Beyond Big Berry Mountain are the forks, and one branch, the Paradis River, rises within a mile of the north side of the Shickshock Mountains in a lake of water 1,700 feet above sea-level and runs southeast between the Logan Range and the higher peaks of the Shickshocks. It then flows southward, and, after a course of 70 miles through an undulating heavily timbered forest, enters Chaleur Bay.

Few of the localities given in this paper on the Cascapedia River will be found on any general map, as they were for the most part taken from a fisherman's sketch map.

The first collecting was done at New Derreen, about ten miles in from the coast, just outside the township lines. Only a short time was spent here and the next collection was made at Middle Camp, about seven or eight miles up the river. The best collecting camp was at Tracadie, twenty miles in from the coast, where specimens of *Sorex fumeus*, *Glaucomys sabrinus*, *Mustela vison* and *Mustela cicognanii*

[2] Geol. Surv. Canada, Bull. no. 34, p. 39. 1922.

were the most noteworthy. Square Forks River is thirty miles in from the coast and runs west, south of Little Berry Mountain. A specimen of *Mephitis* was taken here, the only one in the collection from the whole region. Indian Falls River flows into the Cascapedia from the east about two miles above Square Forks. Lazy Bogan is at the main forks where the river turns west, north of Big Berry Mountain, and is about the geographical center of the great peninsula. Loon Lake is ten miles beyond the forks on the south Lake Branch, about one and a half miles south of Conical Mountain. According to Goldthwait,[3] during the later stages of the glacial period the ice continued to push down from the high mountains in the interior of the Gaspé through the valley of Cascapedia River long after it had disappeared as a great ice field from the coast. The strata and direction in which bowlders and till appear to have been transported seem to indicate that a local esturine glacier moved into the bay of Chaleur from the north, west and south. Evidentally a range of mountains much higher than the Shickshocks of to-day and a contemporary of the Rocky Mountains existed during the glacial period in the interior of the Gaspé Peninsula.

Condylura cristata (Linnæus).—Star-nosed Mole. Three specimens: Ste. Anne de Monts, 2 skins and skulls; Cascapedia valley, 1 skin and skull. Average measurements of two specimens: total length, 192.5 mm.; tail vertebræ, 75; hindfoot, 26.5. One specimen was taken in an open field, in a trap set under an old decayed tree stump which was completely surrounded by water; another was caught in a subterranean runway partly filled with water, close to the river. The rocky condition of the land in the mountains was not suitable for this mole, which seems to prefer soft soil and marshy ground.

Sorex personatus personatus Geoffroy.—Masked Shrew. Fifteen specimens: Ste. Anne de Monts, 4 skins and skulls; Mt. Albert, 7 skins and skulls; Tracadie, 2 skins and skulls; Lazy Bogan, 1 skin and skull; Loon Lake, 1 skin and skull. Average measurements of eight specimens: total length, 96 mm.; tail vertebræ, 43; hindfoot, 11. Specimens of this shrew were taken in the forested mountain country, but not in the open grass-land near the coast though traps were set in likely places. At Mount Albert specimens were taken in traps set in runways in the damp moss and in dry brook channels. These shrews were well distributed throughout the forested area, but considering the large number of small traps that were set and the relatively few specimens secured, it did not appear to be very common.

Sorex fumeus umbrosus Jackson.—Smoky Shrew. One specimen: Tracadie, skin and skull. The only specimen of this shrew was taken by Mr. Childs Frick, August 8, 1921, on the Cascapedia River. That this species was rare seems apparent from the fact that of the large series of shrews taken at Mount

[3] Twelfth Inter. Cong. 1913, Guide Book no. 1, pt. 1, p. 119.

Albert and Ste. Anne de Monts there are no specimens of *fumeus* amongst them. I had hoped that the damp woods with a luxuriant growth of moss on the ground would be an ideal country for dark colored shrews.

Sorex gaspensis Anthony and Goodwin.—Gaspé Gray Shrew. Three specimens: Mount Albert, skins and skulls. Average measurements of three specimens: total length, 99 mm.; tail vertebræ, 47; hindfoot, 11.5.

The small series of this shrew was found at an elevation of 2,000 feet on the cool north slope of the Shickshock Range, and all were taken in the same environment. The first specimen was taken in one of several traps set along a small stream which rushes down the north slope of the Shickshock Range. The place was afterwards thoroughly trapped but no other specimens of this shrew were taken there. Three days later a second specimen was taken in a trap set at the foot of a tiny stream near the foot of Mount Albert. The place was very wet with a thick matting of saturated moss on the ground. Here no other specimens were taken though they were eagerly sought after. The last specimen was taken in one of a large number of traps set for water shrews on a small but very swift stream that came down the north slope of Mount Albert. The trap which was baited with bacon was set in some wet leaves that had caught between the bowlders.

Neosorex palustris acadicus G. M. Allen.—Water Shrew. Three specimens, Mt. Albert, skins and skulls. Average measurements of three specimens: total length, 139 mm.; tail vertebræ, 70; hindfoot, 18. These shrews were trapped on a swift stream coming down through a narrow cañon on the cool north slope of Mount Albert, at an elevation of about 2,000 feet. The stream has a very rocky bed and traps were set around huge bowlders that obstruct its passage. Water shrews appear to be uncommon in this region and very local; of the small series taken, all were trapped on the same stream within half a mile of each other.

Microsorex hoyi (Baird).—Hoy's Shrew. Nine specimens: Ste. Anne de Monts, skins and skulls. Average measurements of nine specimens: total length, 83 mm.; tail vertebræ, 31; hindfoot, 10. This shrew was not uncommon in the sheltered valley of the Ste. Anne River, and specimens were taken in traps set in driftwood that had been left high and dry by floods. This species seems to prefer the dry, open country, as specimens were not taken either in the damp or forested areas. Mr. J. B. DeMille, who secured some specimens alive, said that they made a weak, high pitched purring sound and when trapped would invariably be attacked by one of their brothers; a hole is eaten at the base of the neck through to the lungs. They also attacked a dead hare, which was left overnight in the cabin, in a similar manner.

Blarina brevicauda brevicauda (Say).—Short-tailed Shrew. Six specimens: Ste. Anne de Monts, skins and skulls. Average measurements of six specimens: total length, 111 mm.; tail vertebræ, 24; hindfoot, 15. This shrew did not appear to be at all common and was only taken in the sheltered valley of the Ste. Anne River near sea-level. Specimens were not secured in the mountains or higher up the river. Of the small series secured two were taken in traps baited with bacon and set under old tree stumps at the edge of a forest; one was trapped in an open field; two were taken in old runways on the river bank; and the sixth was caught in a shallow underground tunnel which crossed a path in the woods.

Myotis lucifugus lucifugus (LeConte).—Little Brown Bat. Three specimens; New Derreen, in alcohol. Bats were not plentiful; only occasionally were they seen in the evening. Of the few which were noted all were *Myotis* and probably of the above species.

Euarctos americanus americanus (Pallas).—Black Bear. A bear was seen by a native on August 27, 1923, in an opening in the forest close to the bank of the Ste. Anne River. Mr. DeMille saw traces of bears on Tabletop. One of the hunters along the coast claims credit for killing eighty-six bears in the Gaspé. Two large specimens have been killed in the mountains since we left. Several bear traps were seen on the trail to Mount Albert.

Vulpes sp.—Red Fox. On the trail when returning from Mount Albert one morning just after daybreak, we saw two foxes coming down a steep grade toward us, an adult female and a half grown cub which seemed to be chasing her. Upon seeing us the old fox turned to one side and disappeared in the bushes; the cub retreated back up the hill, stopping at the summit to look back at us. Trappers' reports were that foxes are scarce and hard to trap.

Procyon lotor lotor (Linnæus).—Raccoon. One specimen was reported by Mr. DeMille to have been taken at Riviere Magdeleine during the fall of 1923. It was caught in a trap set for mink on the bank of the river by a trapper. The incident excited a great deal of curiosity as none of the natives had ever seen an animal like it before. The foreman of a pulp mill located there who saw the specimen said it was a raccoon, after consulting Wood's Natural History on his visit home in Ottawa for Christmas.

Martes americana americana (Turton).—Pine Marten. Martens must have been present though no traces were observed, and reports were to the effect that they were sparingly distributed through the timbered mountain region.

Martes pennanti pennanti (Erxleben).—Fisher. Four skins were taken by trappers at Cap Chat during the season of 1923–1924. Reported by Mr. John B. DeMille to be present in the valley of the Bonaventure River. No specimens were taken.

Mustela cicognanii cicognanii Bonaparte.—Short-tailed Weasel. Fourteen specimens: Ste. Anne de Monts, 3 skins and skulls; Mt. Albert, 8 skins and skulls; Tracadie, 2 skins and skulls; Square Forks, 1 skin and skull. Average measurements of nine specimens: total length, 272 mm.; tail vertebræ, 71.5; hindfoot, 37. This weasel was found to be fairly common both at Ste. Anne de Monts and at Mount Albert. Specimens were easily taken in traps set in the forest and baited with squirrels. They were hardy little creatures and difficult to kill. One was caught across the head in a trap and supposing it to be dead I knocked it against a tree, which released the jaws of the trap. The weasel immediately came to life and shot off into the bushes.

Mustela vison vison Schreber.—Mink. Eight specimens: Ste. Anne de Monts, 3 skins and skulls; Mt. Albert, 2 skins and skulls; Tracadie, 1 skin and skull; Square Forks, 1 skin and skull; Lazy Bogan, 1 skin and skull. Average measurements of four specimens: total length, 491 mm.; tail vertebræ, 160; hindfoot, 57. The series consists of six males and two females, all adult specimens. Traps were set in runways along the river bank and specimens were generally secured after heavy rains. They fought ferociously when approached, emitting an odorous secretion of the anal glands, similar to that of the skunk but much milder.

Mephitis mephitis (Schreber).—Canada Skunk. One specimen: Middle Camp, skin without skull. This appears to be a half grown specimen and is probably of the above species. Signs of skunks were not seen at Ste. Anne or at Mount Albert; trappers report that they were not taken on the north side of the Shickshock Mountains and natives did not know of them. One report states that skunks were to be found here thirty years ago in small numbers. Mr. Childs Frick tells me that skunks are not rare in the valley of the Cascapedia River.

Lutra canadensis canadensis (Schreber).—Canada Otter. Four specimens were reported taken by trappers during the season of 1923-1924, two at Cap Chat and two at Ste. Anne. Otters were said to exist above the forks of the Ste. Anne River but were very scarce in the region.

Lynx canadensis canadensis Kerr.—Canada Lynx. Three specimens were reported taken by native trappers during the fall and winter of 1923: one specimen was taken at Riviere Magdeleine and two at L'Anse Pleureuse. Mr. DeMille, who has spent the winter in this region, has the lynx on his list of animals observed. No specimens were secured.

Peromyscus maniculatus abietorum (Bangs).—Dusky White-footed Mouse. Fifty-three specimens: Ste. Anne de Monts, 11 skins and skulls; Mt. Albert, 16 skins and skulls; New Derreen, 1 skin and skull; Tracadie, 14 skins and skulls; Square Forks, 11 skins and skulls. Average measurements of twenty-five specimens: total length, 162 mm.; tail vertebræ, 82.5; hindfoot, 20.

The white-footed mice were the commonest animals in the woods and were most abundant near the foot of Mount Albert. They were often seen about camp during the day and helped themselves to whatever food was accessible; at night they were frequently heard skating down the outside of the tent from overhanging trees. Specimens were not easily taken in the open country along the coast or in the dark damp forest; they seemed to prefer the high open woods. Of the large number of these mice taken each day, only a few specimens were made up.

Evotomys gapperi gapperi (Vigors).—Red-backed Vole. Ninety-four specimens: Ste. Anne de Monts, 17 skins and skulls; Mt. Albert, 32 skins and skulls; New Derreen, 8 skins and skulls; Middle Camp, 8 skins and skulls; Tracadie, 13 skins and skulls; Square Forks, 15 skins and skulls; Indian Falls, 1 skin and skull. Average measurements of twenty-five specimens: total length, 128 mm.; tail vertebræ, 38; hindfoot, 19.

Red-backed mice were very abundant in the cool, moist woods; the quantity of fallen, decayed trees almost buried with moss in the deep shade of the forest seemed to be an ideal habitation for them. Only on one occasion was there evidence of a red-backed mouse coming into camp; the first night after the tent was pitched in the woods one was taken in a trap inside. Although a number of white-footed mice were taken in camp each night no further specimens of the red-backed mouse were taken in this manner. The most striking character about these voles is the individual variation, and it does not seem possible that the extremes from the series can be of the same species, yet a graded selection of specimens make the most gradual steps from one extreme to the other.

Microtus pennsylvanicus fontigenus (Bangs).—Meadow Vole. Eighteen specimens: Ste. Anne de Monts, 10 skins and skulls; Mt. Albert, 5 skins and

skulls; New Derreen, 2 skins and skulls; Middle Camp, 1 skin and skull. Average measurements of eight specimens: total length, 148 mm.; tail vertebræ, 43; hindfoot, 20.

This meadow mouse was fairly numerous in the fields and swampy places near the river at Ste. Anne, but was rare in the forest. Two were taken in traps set on a small mountain stream in the dark forest at the foot of Mount Albert. On the bare summit of the mountain, 3,660 feet in elevation, runways were abundant in the wet and mossy grassland which surrounded the small lakes. Two days and three nights trapping at this elevation secured only three specimens, two adult and one immature. Specimens were not taken anywhere far from water.

Microtus chrotorrhinus chrotorrhinus (Miller).—Rock Vole. Two specimens were taken by Dr. R. M. Anderson of the Victoria Museum, Ottawa, who spent a month in the high mountains in 1922. He says that rock voles seemed to be rare and local.

Ondatra zibethica zibethica (Linnæus).—Muskrat. Six specimens: Ste. Anne de Monts, 4 skins and skulls; Lazy Bogan, 2 skins and skulls. Average measurements of two specimens: total length, 592 mm.; tail vertebræ, 270; hindfoot, 82. Muskrats were said to be plentiful on the slow streams and mud swamps near the coast. The specimens secured were taken in traps baited with bunches of green barley; they were not taken in the mountains or on the swift streams.

Rattus norvegicus (Erxleben).—Norway Rat. Two specimens, immature: Tracadie, skins and skulls. Two specimens were trapped on the river bank at Ste. Anne de Monts but were not saved.

Zapus hudsonius hudsonius (Zimmermann).—Hudson Bay Jumping Mouse. Seven specimens: Ste. Anne de Monts, 6 skins and skulls; Middle Camp, 1 skin and skull. Average measurements of six specimens: total length, 195 mm.; tail vertebræ, 123; hindfoot, 30. This mouse was found to be fairly common and specimens were taken in the open grass country and in the clearings along the coast. No specimens were taken in the forest or in the mountains. Most of these jumping mice were captured by first locating them in the long grass and then knocking them down with an old game bag.

Napæozapus insignis insignis (Miller).—Woodland Jumping Mouse. Ten specimens: Ste. Anne de Monts, 3 skins and skulls; Mt. Albert, 7 skins and skulls. Average measurements of nine specimens: total length, 236 mm.; tail vertebræ, 146; hindfoot, 30.

This jumping mouse was only taken in the forested country and most of the specimens were caught in traps set in tall dead grass along the banks of small mountain streams. Though most of the series taken were trapped at night, two of these jumping mice were seen out at noon; which goes to show that they are somewhat active during the daytime. At this time they permitted me to approach within a few feet of them before attempting to escape. All of the specimens taken were very fat. After a sharp frost on September 7, no additional specimens of jumping mice were secured.

Erethizon dorsatum dorsatum (Linnæus).—Canada Porcupine. Four specimens: Ste. Anne de Monts, 1 skin and skull; Mt. Albert, 2 skins and skulls;

Tracadie, 1 skin and skull. Average measurements of two specimens: total length, 635 mm.; tail vertebræ, 192; hindfoot, 91.

The first porcupine was killed on a woodland path near Ste. Anne; a second was shot as it hurried down a small sapling in some thick bush close to the river. The largest specimen was trapped in the hollow of a huge tree trunk that lay on the ground near the foot of Mount Albert. Mr. Childs Frick tells me that the porcupine that he secured on the Cascapedia River was first seen swimming strongly across the river and was captured as it came to land. Porcupines were not as plentiful as they had been reported to be; with the exception of the specimens secured I saw no traces of them.

Marmota monax canadensis (Erxleben).—Canada Woodchuck. Five specimens: Ste. Anne de Monts, 5 skins and skulls. Average measurements of five specimens: total length, 494 mm.; tail vertebræ, 113; hindfoot, 72. The series consists of one male and four females, ranging from a half grown specimen to an old female with well-worn teeth. Woodchucks were commonest in the open country along the coast. On a warm summer evening after heavy rains I counted fifteen of them sunning themselves on old tree stumps in one corner of the field; two specimens were shot and the rest dived into their holes, but a few minutes brought them out again. One woodchuck was seen in the forest near the foot of Mount Albert.

Tamias striatus lysteri (Richardson).—Striped Chipmunk. Sixteen specimens: Ste. Anne de Monts, 9 skins and skulls; New Derreen, 1 skin and skull; Tracadie, 3 skins and skulls; Middle Camp, 2 skins and skulls; Square Forks, 1 skin and skull. Average measurements of six specimens: total length, 281 mm.; tail vertebræ, 110.5; hindfoot, 44.5 Chipmunks were common in the sheltered valley of the Ste. Anne River and the open grass-land near the coast. On bright sunny days after rain many of them could be seen basking in the warm sun. Chipmunks were not taken in the cold mountain regions or in the damp spruce forests.

Sciurus hudsonicus gymnicus Bangs.—Red Squirrel. Nine specimens: Ste. Anne de Monts, 7 skins and skulls; Mt. Albert, 1 skull; Tracadie, 1 skin and skull. Average measurements of six specimens: total length, 281 mm.; tail vertebræ, 110.5; hindfoot, 43.5. This squirrel was found in great abundance and its shrill cry was the first sound that greeted us in the morning. All the way to Mount Albert from Ste. Anne it was constantly seen and heard. Red squirrels proved a nuisance by getting into so many of the traps set for other game.

Glaucomys sabrinus sabrinus (Shaw).—Northern Flying Squirrel. Four specimens: Mt. Albert, 2 skins and skulls; Tracadie, 1 skin and skull; Cascapedia River, 1 skin. Average measurements of two specimens: total length, 282.5 mm.; tail vertebræ, 135; hindfoot, 40. The small series consists of two adults and two half-grown young. One specimen from the Cascapedia River has no exact locality and appears to be a winter skin.

I did not encounter many flying squirrels although I was on the lookout for them in likely places. The two from Mount Albert were taken in steel traps baited with meat and set at the foot of a big fir tree on a steep, dangerous grade going down to the Ste. Anne River. Both specimens were alive when I took them out and fought viciously, uttering shrill cries. Late one night I heard

VIEW UP THE STE. ANNE RIVER, TEN MILES INLAND FROM THE COAST

DEVIL CREEK, A TRIBUTARY OF THE SOUTH BRANCH OF THE STE. ANNE RIVER; ELEVATION ABOUT 1,500 FEET

(Goodwin: Mammals of Quebec.)

HEAVY FOREST AT 2,000 FEET ELEVATION. MOUNT ALBERT IN THE BACKGROUND

THE SUMMIT OF MOUNT ALBERT IS A SMALL TABLE-LAND COVERED WITH A MASS OF WEATHERED SERPENTINE; ELEVATION 3,660 FEET

(Goodwin: Mammals of Quebec.)

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one making a similar cry as it passed close by the camp in the woods; from the speed with which the intensity of the call died out, the animal must have been traveling very rapidly, as in a short time the sound died away in the distance.

Castor canadensis canadenis Kuhl.—Canada Beaver. One skull, Mount Albert. The skull has mandible and rear part of skull missing: it was picked up out of the mud at the forks of the Ste. Anne River. The teeth showed slight wear; compared with skulls of about the same age from the Adirondacks, it is considerably smaller. Joe Fortin, Canadian guide, said that there were a few beavers left above the forks of the river and that they live in holes in the river bank. In a letter, Mr. DeMille tells me that a beaver house is located on one of the seven lakes forming the source of the Bonaventure River.

Lepus americanus struthopus Bangs.—Snow-shoe Hare. Seventeen specimens: Ste. Anne de Monts, 11 skins and skulls; Mount Albert, 4 skins and skulls; Square Forks, 1 skin and skull; Indian Falls, 1 skin and skull. Average measurements of five adult specimens: total length, 428 mm.; tail vertebræ, 36; hind foot, 133.

The collection consists of a good series of summer skins and five good winter skins sent to me by a native since my return. The specimens represent all ages, ranging from a few weeks old to fully adult. Most of them were trapped while feeding on freshly cut spruce branches that were put around the traps. Snow-shoe hares were fairly common in the forest and I often saw them about during the day; they seemed to prefer the darkest of the fir forest. About twelve o'clock one night we were awakened by some animal making a peculiar cry in the tent. Getting out a flashlight we saw a large hare sitting up in the middle of the floor; after a few minutes inspection, it leisurely retreated through the entrance.

Odocoileus virginianus borealis (Miller).—Northern White-tailed Deer. Specimens were not secured. Tracks of deer were seen in the sand along the river at Ste. Anne de Monts. The skull and feet of a large female, evidently left by some hunter, were seen in the forest on the trail to Mount Albert. Recent forest fires, it was reported, accounted for the present scarcity of white-tailed deer in the valley of the Ste. Anne River.

Alces americana americana. (Clinton).—Moose. There are a few moose on the head-waters of the Ste. Anne River, traces of which were seen in the swampy places at the foot of Mount Albert. Mr. Ludlow Griscom reports that moose were seen daily by members of his party at Tabletop Mountain, in July, 1923.

Rangifer caribou caribou (Gmelin).—Woodland Caribou. Caribou were fairly common on the higher peaks of the Shickshock Range. Many bones and a few discarded antlers were found on Mount Albert; also two dead animals were seen in a ravine. On September 7, 1923, fresh tracks of a small herd of about six caribou were seen about half way up the mountain. Mr. DeMille states that he counted forty-eight caribou at one time on Tabletop Mountain; he also says that there is a caribou frequenting the lower valleys which does not congregate in herds, with horns modified to allow easier movement through the thick undergrowth.

American Museum of Natural History, New York.

NOTES ON THE BREEDING OF PEROMYSCUS

By Theo. H. Scheffer

Incidental to field studies of the pocket mice, continued through a period of more than a year, opportunity came to the writer to note also certain activities of the local species of white-footed, or deer, mouse, *Peromyscus maniculatus gambeli*. These investigations were made in central eastern Washington, well up, therefore, in a range as far north as that occupied by any species of this type of mouse in our country, for it extends into the British possessions. The district is semiarid to a greater degree than the term ordinarily implies, as the average annual rainfall is only 7 or 8 inches. The land is rolling (in most places) and intersected by coulees and covered with sagebrush except where the plow has more recently had its way.

The very general practice of growing light crops of wheat in the district has brought about a marked increase of numbers in at least two of the types of field mice that are indigenous, and has encouraged the spread of the introduced *Mus musculus*. Pocket mice (*Perognathus*) and white-footed mice (*Peromyscus*) have become a serious farm pest in some localities. Mice of the three genera mentioned, together with grasshopper mice (*Onychomys*) and the harvest mice (*Reithrodontomys*), may sometimes be trapped on the same acre of ground, remote, too, from any farm dwellings. Seed sowing in the fall and spring and somewhat wasteful methods of harvesting the wheat in midsummer, furnish a fairly continuous supply of food for the small grain-eating rodents. Volunteer rye is allowed to occupy the roadsides to prevent soil drifting and, as if further to accommodate the mice, tumble weeds (*Salsola pestifer*, particularly) distribute their generous loads of seed from burrow to burrow.

Outside the natural cover of sagebrush and its debris, the mice find shelter in the growing grain and the harvest stubble, according to the season, or in the weed forests of wild mustard and Russian thistle that occupy abandoned farm lands. The small rodents congregate in greatest numbers, however, along the fence lines, where soil drift and tumble weeds constitute for them a safety zone. Approximately half the farm lands lie fallow during the summer, after the stubble is turned under in the spring. This practice of summer fallowing causes a local shifting of part of the mouse population from one season to another, since for several months at a time the plowed fields furnish no food whatsoever.

Just what particular bearing any one or several of the ecological factors outlined above may have on the breeding of *Peromyscus*, can be left to the investigator who is able to make comparisons. For his benefit I have sketched in the background.

Peromyscus maniculatus gambeli, in the district of central eastern Washington, breeds at all seasons of the year, even in the depth of midwinter. Pregnant females and partly grown young may be found in all months from January to December. The following table groups together the more important data accumulated in the investigations:

COLLECTING DATES	INTERVALS BETWEEN COLLECTIONS	SPECIMENS TAKEN				PREGNANCY				NUMBERS OF FETUSES	PERCENTAGE PREGNANT
		Total	Males	Females	Immature	Early	Medium	Advanced	Total cases		
1923	*days*										
January 9 to 11		28	18	10	0	6	0	0	6	5, 6, 6, 5, 4, 5	60
February 25 to March 3	45	48	24	9	15	2	0	0	2	5, 9	22
April 2 to 9	30	52	34	17	1	4	2	1	7	8, 7, 5, 6, 5, 5, 7	41
May 6 to 12	27	58	23	25	10	3	1	*(2)	4	5, 7, 5, 5, (5, 6)	16
May 28 to June 2	16	41	11	23	7	1	1	2	4	5, 6, 5, 4	17
June 25 to 30	23	55	33	12	10	3	2	2	7	5, 5, 3, 4, 5, 6, 3	58
July 23 to 30	23	49	36	11	2	1	2	0	3	4, 6, 4	27
August 28 to 30	29	35	20	9	6	2	1	1	4	5, 5, 5, 5	44
September 23 to 28	24	43	27	13	3	2	3	1	6	5, 4, 4, 3, 3, 4	46
November 3 to 7	36	11	8	3	0	1	1	0	2	5, 5	66
December 10 to 14	33	94	30	27	37	3	0	0	3	6, 5, 4	11
Totals		514	264	159	91	28	13	7	48	Av.pregnant	30

Average number of young.....5 Maximum number of young.....9
Commonest number of young.....5 Minimum number of young.....3
*Taken in nests.

It is to be regretted that additional specimens were not secured between the early January and the late February collections, and also that the early November catch was so small. In the table above, however, there is enough material data fully to support the conclusion that this species of mouse breeds continuously throughout the year. It may be noted here also that the adult males are always in good breeding condition, as indicated by the prime development of the sexual organs in every month. In certain other rodents, for example the pocket mice of the same locality, the sexual glands of the male are reduced to insignificant proportions out of the breeding season.

Several nests of *Peromyscus* were uncovered at comparatively shallow depths in the dry subsoil, which here is of the loess type. In each case the burrow system was quite simple, consisting of two or three short branches converging from as many outer entrances to a single tunnel which slopes rather steeply down to the nesting chamber. The latter is globular in outline, between 3 and 4 inches in diameter, and is 2 feet, more or less, beneath the surface of the ground. Although there may be one or two short pocket tunnels connected with the nesting chamber, there seems to be only one line of communication with the outer world.

The nests are made of fine grass, shredded weed stems, and any other soft material to be had within the range of the little animal. In one case the materials were almost exclusively jack rabbit fur, and in another a few bird feathers were used. The nest ball is always hollow and completely fills the cavity excavated in the soil. I have found in one of these the pregnant mother, in another a litter of the blind, naked young, and in a third the fully furred little mice. In the last two cases the mother had been trapped. From the evidence of the numerous badger diggings noted in the stubble during the fall and spring, it seems probable that many of these nests of the white-footed mice are scented out and pillaged by that animated steam shovel.

Biological Survey, U. S. Dept. of Agriculture.

ADDITIONAL NOTES ON CALIFORNIA BATS; WITH OBSERVATIONS UPON THE YOUNG OF EUMOPS

By A. Brazier Howell and Luther Little

[*Plate 30*]

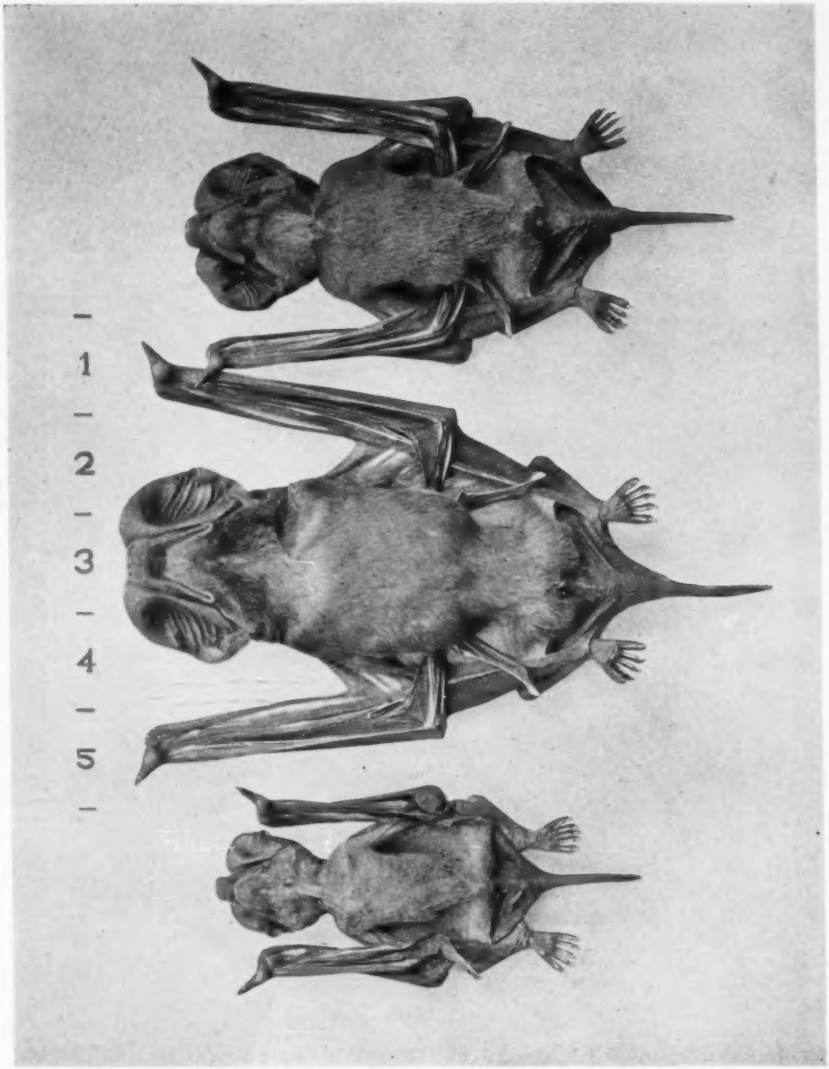
On June 16, 1923, we visited several colonies of bats in the San Gabriel Valley of Los Angeles County, California. Investigation in the loft of a certain garage near Covina disclosed about three dozen females of *Eptesicus fuscus fuscus*, most of them with small young, well hidden behind the sheathing of one of the gables. About a dozen of these were secured in a somewhat desultory fashion—for they were not really needed as specimens—and thrust into a sack with scant ceremony. It was not until they were being extricated from this, after we had returned to Pasadena, that we discovered two of these individuals bore Biological Survey bands numbers 11556 and 11557 upon the hind legs. One of these bands was so much scratched, as if from being worried by the teeth of the bat, that the numbers were with difficulty deciphered; but it was in proper place—almost meeting around the tibia without piercing the surrounding membrane. The other band was not abraded to any extent but it had penetrated through the membrane on both sides of the leg. The membrane fitted the band snugly, however, and the latter was evidently of no inconvenience to the wearer. Reference to the notes of the senior author showed that these bats were two of five which were captured in this same loft July 20, 1921, taken to Pasadena some twenty miles away, banded, and there released the same evening. Hence, these bats had returned to what we may call their original home, and were occupying it two years after having been first caught. A different portion of the loft was being occupied during 1923 than on the previous occasion, however, and there are no bats at all to be found here during the winter months, when they evidently migrate southwards. After being examined, these two banded bats were once more liberated—in South Pasadena this time.

The female *Eptesicus* taken had only a single young in each case, varying in size all the way from newly born to nearly half grown. They were normally carried not clingling to the under surface of the female with feet and wings "spraddled" out, but in such position beneath the membrane as to face the same direction as the dam, strongly reminding us of the attitude assumed by a human mother when walking with an arm and a portion of her cape over the shoulders of her child.

Upon visiting our most populous colony of *Eumops californicus* in the attic of a three story house near Covina, we found at this date some twenty-five young, varying from individuals which we judged to be about one week old, to those three weeks or more of age. These youngsters clung to the studding of the roof closely herded and in such position that but few of them could be reached and these barely by means of the long forceps. Every adult had scrambled down between the walls far beyond reach. The young secured were preserved as spirit specimens and their subsequent study proved rather interesting. For this purpose the youngest and oldest juveniles were selected for photographing and comparing in detail with an adult. In the accompanying table the second set of figures in each column represents percentages of the total length for the various parts of the individual measured, such treatment of the measurements giving data that are much more significant when compared.

MEASUREMENTS—IN MILLIMETERS	AD. ♀	JUV. ♂	JUV. ♀
Total length	167 —100%	136 —100%	110 —100%
2nd digit—wrist to tip	139 — 83.2	113 — 83.1	63 — 57.3
Forearm	77 — 46	68 — 50	48 — 43.5
2nd metacarpal	77 — 46	63 — 47.7	39 — 35.4
Proximal phalanx—2nd digit	32.5— 19.4	23.5— 17.3	13.5— 23
Thumb	8 — 4.8	9 — 6.6	10 — 9.1
Tail	61 — 36.6	47 — 34.6	37 — 33.7
Tibia	26.5— 15.9	25.5— 18.8	20.2— 18.4
Foot	16 — 9.6	17 — 12.5	17 — 15.5
Length ear from notch	38 — 22.8	28 — 20.6	20.5— 18.6
Project. nose beyond lower lip	12 — 8.2	8 — 5.9	6 — 5.5
Project. nose beyond ear	2 — 1.7	4.8— 3.5	5.3— 4.8

A scrutiny of these figures discloses the fact that the development is more rapid from the smallest to the intermediate example, than from the latter to the adult, as might be expected. In the smallest specimen, the wing—especially the membrane—is proportionately very weak and undeveloped, but not to an equal extent in all portions of this member. The measurement from the wrist to the tip of the wing is especially short, the chief reason for this being the brevity of the metacarpals; but the proximal phalanx of the longest digit (the second) is proportionately longer in the youngest specimen than in either of the others. We were surprised to find that the thumb is actually longest in the smaller juvenile, and also that the nodular callosity at the base of the thumb



EUMOPS CALIFORNICUS

Ventral aspect of adult female and two young. Reduced

(Howell and Little: California Bats.)

UNIV OF MICH

is proportionately fully as developed, but of a finer texture, as in the adult. This state of affairs may indicate a tendency towards atrophy of this digit at the present day because of lessened use, and also that the callosity constitutes the modern degeneration of some sort of a suction disk which, in conjunction with a stouter thumb, enabled the distant ancestors of these bats to clamber about in precarious situations with greater surety and agility than their descendants are capable of showing. The proportionately longer tibiæ and feet of the immature are probably without significance in this connection, merely being in accordance with the tendency of the feet of most young mammals to develop with disproportional rapidity. As may be seen in the illustration, the unusually long snout of *Eumops* is developed at a very early age and must consequently be a deep seated character; but the large size and intricate pattern of the external ear is not so well developed in the juvenile, and this fact probably indicates that such constitutes a relatively recent specialization of the animal. Upon the adult female in the photograph there is no external sign whatever of a gland upon the lower throat, but the larger immature (a male) plainly shows this gland, and it is fully as large, relatively, as it is upon adult males that are sexually inactive. What is still more surprising is that there is such a gland, though decidedly small, upon the smallest juvenal female, possibly indicating that this gland was not originally merely a secondary sexual character of the male but was at one time present in both sexes. What may be its function, if other than a simple scent gland, or why it has been practically lost by the female while retained in an active condition by the male, is a problem difficult to solve.

Still another point of interest is the fact that although the body of the smallest bat illustrated is practically hairless, there is a row of long, curved hairs projecting about 5 mm. beyond the ends of the toes. In the example next in size these hairs are about 6 mm. in length, while in the adult, they are no longer, but, indeed, considerably shorter because of wear. It can hardly be doubted that these hairs are connected with special tactile nerves in the toes, serving a useful purpose when the bat is backing into and about dark crannies, and their development at such an early age indicates early and deep-seated specialization in this respect.

Pasadena, California.

GENERAL NOTES

DISTRIBUTION OF THE NORTHERN PLAINS MOLE IN COLORADO

In North American Fauna No. 38, Jackson gives the type locality of *Scalopus aquaticus caryi* as Neligh, Antelope County, Nebraska, and lists a specimen from Wray, Yuma County, Colorado. Previous to the publication of North American Fauna No. 38, Warren (Mammals of Colorado) and Cary (N. A. Fauna, 33) listed moles from Yuma County. Warren listed his under the name *S. a. machrinus*, Cary his under *S. a. intermedius*. Cary in the same publication remarks as follows: "Moles enter the northeastern part of the State from the plains. Thus far, they are known only from Yuma County, but very likely occur throughout the sand hill region from the Arickaree Valley north at least to Holyoke."

We have a specimen of *caryi* in the college collection from Merino, southwestern Logan County. We have also seen moles working near Akron, Washington County, and Julesburg, Sedgwick County. The infestation at Merino covers a radius of about five miles around the town in the irrigated sections.—W. L. Burnett, *State Agricultural College, Fort Collins, Colorado.*

MICE AND MOLES

Circumstantial evidence has convicted the mole many times of eating flower bulbs. The gardener, carefully planting his tulip and gladioli bulbs, is somewhat dismayed to find them dying before blossom time. Investigation usually reveals a burrow under the individual plants, and, as moles are in the vicinity, this animal is immediately blamed for the depredation. While the mole is present, there is more evidence at hand to show the bulb is not an item in the mole's diet. Mouse traps set in mole runways usually capture trespassers, meadow mice (*Microtus*), or the house mice (*Mus musculus*).

In western Washington, bulb losses have amounted to such large proportions that investigation of probable cause was necessary. Burrows of the Townsend mole (*Scapanus townsendii*) and the coast mole (*Scapanus orarius*) are on almost every acre of ground. In their runways, the Oregon meadow mouse (*Microtus oregoni*) is very often caught. Recent investigations revealed large numbers of camas bulbs (*Quamasia azurea* Heller) in mounds excavated from mole runways. It appears that these bulbs were numerous in a low grassy meadow, and the mole, finding them in his way, would push them to the surface as it would a pebble. Examination of the bulbs failed to show even teeth marks, although as many as fifteen were found in a single mound. The camas bulbs are edible, playing an important part in the diet of the Northwest Indians. Forcing a few bulbs in a green house revealed the identity of the plant.

This is offered to show that if it were physically possible for the mole to eat bulbs, it probably would leave its mark, as in the case of the meadow mouse and pocket gopher.—Leo K. Couch, *Biological Survey, Olympia, Washington.*

THE ARMADILLO IN FLORIDA AND HOW IT REACHED THERE

In 1922 a small boy appeared at the Miami Beach zoo and offered me an armadillo. On my requesting information as to where he got it, which he was

not inclined to give at first, fearing he had violated some game law, he informed me "his dog had caught it between Allapatta & Hileah," suburbs of Miami, Florida. I secured the animal, a male, and commenced to look around to find the possible source of supply. After some time, I learned that during the late war a marine had been stationed at the canal locks near Hileah, and that he had brought a pair of armadillos from Texas when he came. These he liberated on leaving his station after the war. In February, 1924, I learned of a female with four young being killed, and I am thus inclined to think they are increasing in numbers. I am publishing these facts now to offset some "state record" that might be made in future years by some visiting naturalist that might hear of a new Florida animal. These introduced species sometimes lead to good jokes on the discoverer.—H. H. BAILEY, *Miami Beach, Fla.*

GROUND SQUIRRELS AND WEASELS

About Camp Roosevelt, Yellowstone National Park, are many Kennicott's ground squirrels, *Citellus armatus*. Many had their burrows in the open space in front of the cabin I occupied during my stay in the summer of 1923. Here I witnessed what seemed to me a very unusual occurrence.

About five o'clock in the afternoon of August second I was sitting at my table writing, and, happening to glance out of the door, I saw one of the ground squirrels chasing a half grown mountain weasel (*Mustela arizonensis*), which seemed decidedly afraid of its pursuer. They came into sight from one side, the squirrel but a few feet in the rear, and the weasel dodged into a hole not far from my door. The squirrel stopped, then began eating a head of grass. Presently the weasel came out of the burrow and the squirrel started after it again. This time the weasel went into a hole thirty or forty yards from the cabin, and I walked over there. The weasel was halfway out of the hole standing erect, and about ten feet away was the squirrel sitting up and nibbling *Eriogonum* flowers. The weasel looked around in every direction and evidently saw the squirrel, while the latter was just as conscious of the presence of the weasel, which came out of the hole once, but dodged back when the squirrel made a move toward it. Finally the weasel came out and made a run to another hole a short distance off, while its enemy came over to the one it had left and sat up straight. Then the weasel made another dash and got away into the thick brush, while the squirrel made no attempt to pursue it.

It certainly seemed an extraordinary occurrence, and one which I surely never expected to see. One would think weasels would be among the squirrels' worst enemies, and that the latter would be in mortal fear of them.

Several days later, August 8, I saw either the same weasel or another of about the same size. Though there were several ground squirrels sitting up in the grass about the place, none of them seemed to be the least afraid of the weasel, but went on unconcernedly with their feeding. One chased the weasel a short distance, and once the latter came within a few inches of a squirrel, which paid no attention to it. The weasel seemed to be just playing about. It ran around in the grass here and there, and once I saw it roll and tumble over and over in the grass much as a young kitten or puppy would do. It ran off into the brush when I tried to approach it closely. About five in the afternoon of the same day I saw it or another one near my door; that was the last time it came about.

Several days later I learned from Julius, the camp teamster, that a family of weasels were living nearby, and that he had seen several young. Henry Lambert, an old timer who made his headquarters at the camp, told me that he had once seen a ground squirrel chasing a full grown weasel on the prairie, and that the weasel appeared to be doing its best to escape from the squirrel. Julius told me that once in March, when he was shoveling snow from the roof of a building at the camp, a very small weasel followed him up the ladder to the roof. He thought it very strange there should be a young one about at that season, not knowing that there were two species of weasels in the Park. Doubtless this was an adult of the least weasel, *Mustela cicognanii lepta*.

The young ground squirrels about the camp seemed to vary much in size, so much so that it caused me to speculate as to the cause. I noticed this in 1921 and in 1923. July 28 of the former year and August 11 of the latter, I noticed young so small that it did not seem as if they could have been out of the hole more than a day or two. Is the breeding season extended over a considerable period, or do the females of the preceding year breed later than the older ones? There was certainly so much variation in the size of the various lots of young about the camp that some such explanation appears necessary.

These animals begin hibernating very early. The latter part of July, 1923, I saw them carrying dried grass into the burrows, evidently for bedding. By August 13 their numbers had decidedly decreased, practically all the adults having disappeared; and when I left Camp Roosevelt, August 24, very few of any age were to be seen. In 1921 one was seen August 31, the last, for I remained several days later and saw none.

It appeared to me that there were more of these animals about the camp in 1923 than in 1921. This seemed to be the case not only in the immediate vicinity of the camp but also at Yanceys, two miles away, where there were no inhabited buildings to serve as protection from coyotes or hawks. It is quite possible that the killing of so many predatory animals in the Park may have resulted in an increase in the number of these ground squirrels. Hawks do not seem especially plentiful in that locality. I saw several marsh, Swainson's, and western red-tail hawks during the two summers I spent there.—Edward R. Warren, *Roosevelt Wild Life Forest Exp. Station, Syracuse, N. Y.*

PROVISION OF PRAIRIE-DOG TO ESCAPE DROWNING WHEN TOWN IS SUBMERGED

The diagrams herewith submitted showing construction of laterals used by prairie-dogs are taken from burrow excavated near Prescott, Arizona, by Mr. R. R. Beck and the writer on October 5, 1923.

This burrow, along with many others, showed to have been under at least three feet of water only a short time before, yet judging from the number of live dogs seen at this time there had evidently been very few drowned. This was verified by the owner of the ranch who further stated that he had seen this area under water for several hours at two different times during the season and that he could never tell that any dogs had disappeared.

As there were seven of these laterals in this burrow system and five of the number came to within eight inches of the surface it is quite evident that the dog can remain in either of them in comparative safety for several hours, as

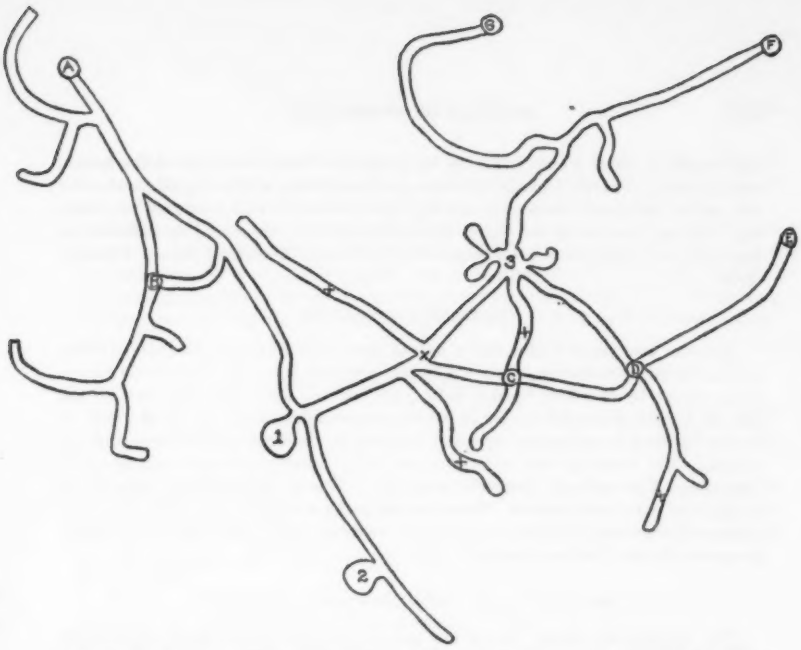


FIG. 1. DIAGRAM OF BURROW OF WHITE-TAILED PRAIRIE-DOG (CYNOMYS GUNNISONI ZUNIENSIS) EXCAVATED NEAR PRESCOTT, ARIZONA, OCTOBER, 1923

Scale, 1 inch = 4 + feet. Average depth, 3½ feet; diameter, 5 inches. A B C D E F G indicate entrance to burrow. × indicates location of laterals going straight up from burrow. 1, 2, 3 indicate nests.

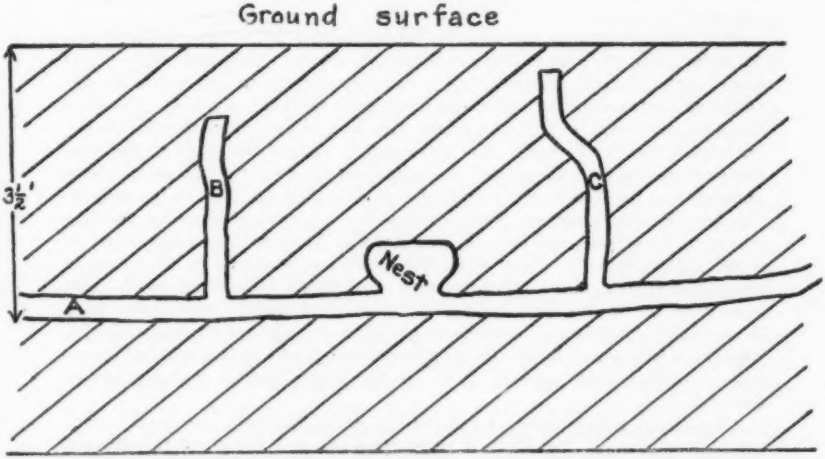


FIG. 2. SECTIONAL SIDE VIEW OF BURROW OF WHITE-TAILED PRAIRIE-DOG (CYNOMYS GUNNISONI ZUNIENSIS) EXCAVATED NEAR PRESCOTT, ARIZONA, OCTOBER, 1923, SHOWING CONSTRUCTION OF LATERALS USED IN TIMES OF FLOOD

A—Main runway of burrow. B—Lateral going straight up from burrow to within 18 inches of surface. C—Lateral reaching to within 6 inches of surface.

the inrush of water would cause an air pocket to form in the top of the lateral which would last until the air could escape through the earth. As the surface of the ground gradually became moist the air would have less tendency to escape and it is the opinion of the writer that this supply of air would be sufficient to last the prairie-dog for several hours.—B. E. Foster, *Biological Survey, Phoenix, Ariz.*

"WARBLES" ON NEOTOMA

For over two years I have had a pair of wood rats (*Neotoma intermedia intermedia*) under observation, their abode being within the wall of my little mountain retreat in the Box Spring Hills just beyond Riverside, California. On March 2, 1924, I caught a male in a box trap and found him to be the host of larval bot flies as evidenced by great blisters on the back and sides of the abdomen. The larvæ at this time were just about ready to emerge and drop for pupation. The animal, formerly very fat, seemed considerably reduced in weight but was very active. Three weeks later I caught a female and scars indicated that she had previously had "warbles" too.—Edmund C. Jaeger, *Riverside Junior College, Riverside, Calif.*

THE RED-BACKED MOUSE AS A TREE INHABITER

The red-backed mouse (*Evotomys gapperi saturatus*) is rather universally distributed throughout the timbered areas of Washington, especially in the higher elevations. It is a shade-loving animal and inhabits earthen runways which penetrate the old root-entangled surface stratum of the forest floor; the burrows leading from some protecting stump or log pile. It is not always found in wooded areas, but is occasionally taken at the edge of the water, near old stumps and other shelter, in grassy swampy situations, bordering dry hillsides, especially in late dry summer; but deep shady forest is the rule.

That red-backed mice are truly terrestrial would seem to have its exception. At Indian Henry's, Mount Rainier, at an elevation of 5300 feet, while I was enjoying the sunlight and flowers of a warm south exposure, my attention was attracted by the sound of scratching claws upon the bark of a large sub-alpine fir (*Abies lasiocarpa*). A glance in the direction of the sound showed the unmistakable form of *Evotomys* dart quite rapidly around the trunk of the tree, two or three feet from the ground, and disappear from sight. This seemed very unusual, and resulted in my returning next day, July 11, 1919, to investigate. The tree, a fairly large one, with a rather dense growth of branches reaching almost to the ground, had been injured probably by snow some years before at a point fifteen feet up. Here, where the leader had been broken, three prongs now six or eight inches in diameter shot up, forming a sheltered crotch quite away from the storm. On climbing to this point, I found a neat mouse nest. It was made of a lichen (*Usnea*) commonly found among the branches of the fir. The owner was not at home and may have taken fright at this unusual occurrence. A later visit, however, gave me the satisfaction of catching him in the nest.

These little tawny-backed creatures are quite decidedly nocturnal, hence not commonly seen. Yet there is an exception to this, for about this time of

year when the snow is melting from the mountains and their winter quarters are revealed, they are now and then seen fleeing over the top of the snow in broad daylight. Then they may be taken in traps both day and night.

That tree life is unusual with this species would seem evident, as four subsequent years of close study in the forests of the mountains of the state have not furnished me with another case, and this arboreal site may have been selected temporarily, to avoid a less congenial terrestrial condition of melting snows and wet ground.—WILLIAM T. SHAW, *State College of Washington, Pullman, Washington.*

ON PHOTOGRAPHIC CAGES

It is safe to assume that every man on the 600-membership roll of the Mammalogists' Society uses a camera and considers it part of his equipment for the study of mammals.

While the ideal photographs of mammals are made from wild specimens free in their native surroundings, the difficulties of such photography are so great and the opportunities so few that, as a matter of actual practice, the majority of photographs, and the best of them on the whole, are made from captive animals.

Most of the cages in zoological gardens are constructed as though it were intended to make photography impossible. They are ill-lighted and have hideous backgrounds. They have square floors, instead of uneven ground to give variety of pose. They are without provision for eliminating the bars, and it is by luck rather than by management that the animal comes within the range of the camera.

Many heart-breaking, film-wasting experiences led me, some ten years ago, to plan a cage that should be photographically perfect. Since then, I have made three or four, each embodying some new idea, or planned to eliminate some element of ill-success. For example, one of my most ambitious attempts was about 20 feet square, with everything in it whitewashed, while trees about gave peeps of real landscape. I found that every tree or building nearby robbed me of light, and by so much slowed up the exposure. The whitewash helped, but also caused halation, and the cage was so big that the animal could wander out of the field of the camera. The next cage was so small that the wires cast a network shadow on the animals.

The last one and the most successful is constructed as follows: First, it is 10 feet long, the shortest focal length of my camera being 8 feet. It is 6 feet wide and 6 feet high at the animal end, and but 3 by 3 at the camera end. At the animal end is a solid background painted in simple landscape effect like the screen in a photographic studio. This, of course, can be varied. The ground is uneven, and a variety of logs, brush, plants, grasses, etc., are at hand for change of scene.

The cage is raised about 2 feet from the ground, so that the camera may point nearly level at small animals. The camera end is a solid wooden wall with a 4-inch peephole through which the camera points, and behind which the operator may remain unseen. Outside is a solid shelf to hold the camera.

By using very fine wire and keeping it up high, there is no net shadow cast. That is, for example, a wire cloth of 1-inch mesh, 14-guage wire, will, under

direct sunlight, cast a netted shadow on everything 3 feet below it, but not at 10 feet, for the light eats up the shadow when the screen is so far from the object. 20-guage wire permits of a still lower roof screen, and for some animals, of course, no over-screen is needed. That, however, would presuppose a second cage. Wire that is painted black is less visible than light-colored wire. Black paint tends to obliterate the wire, white wires tend to obliterate the animals.

The heavy timbers of the frame are often a disfigurement, especially when they are of straight-sawn stuff. The best answer to this problem is an iron frame. My present plan is to use ordinary iron piping, inch or inch-and-a-quarter, for the over-structure.

Many of these observations apply only in strong sunlight. For veiled light, of course, the difficulty of the netted shadow disappears.

Other conditions are: The cage must be out in the open, removed from all trees and buildings that would reduce the light. It must be movable, so you can swing it about to change the effect. It must be high enough from the ground so you can watch your finder, etc., without undue stooping. It is all the better if you can approach the camera peep without the animal's seeing you or knowing you are there.

It is quite feasible to have the cage marked off in feet like a football field, so that you can tell at a glance what change to make in your focus. Your cage must, of course, be more or less adapted to your own special camera. In any case, the whole of the object end of the cage must be in the camera field the whole time.—Ernest Thompson Seton, *Greenwich, Conn.*

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CORRESPONDENCE

COÖPERATION FOR LIFE HISTORY WORK

Letter to Members of the American Society of Mammalogists:

The Committee on Life Histories of Mammals plans to compile a list of persons now active in the study of mammalian life histories. It is hoped that interested members will coöperate with the Society by submitting information regarding their work in this field.

Under life histories we include every aspect of the study of the habits and lives of mammals. Suggested topics include behavior, relations to surroundings, interrelationships of species, times of activity, flocking and social habits, migration, hibernation, estivation, movements, tropic responses, means of communication, habits associated with eating and drinking, individual traits, relation of habits to existence and survival, to structure, and to distribution, breeding habits, dens, nests, and other places of resort, methods of life history study.

Since studies of life histories of mammals are fundamental to practically every phase of investigation in mammalogy, including taxonomy, phylogeny, genetics, ecology, physiology, paleontology, embryology, anatomy, economic mammalogy, conservation, nature study, and education, your Committee believes the compilation of an up-to-date list of workers with suggestions as to their work and perhaps a general discussion of trends and tendencies in this field will be of broad general interest and much value.

If you are specially interested we would appreciate it if you would send in to the Committee the following information:

In what phases of mammalian life histories are you interested?

On what life history projects are you now engaged and what species of mammals are directly concerned?

In what localities have you carried on life history work?

What do you consider to be the greatest need in the field of life history study at present?

Please communicate at once, incorporating any additional information or suggestions which you may have, with the chairman of the Committee on Life Histories of Mammals, Box 402, University Station, Tucson, Arizona.

The Committee on Life Histories of Mammals.
CHAS. C. ADAMS,
VERNON BAILEY,
WALTER P. TAYLOR, *Chairman.*

THE J. A. ALLEN MEMORIAL FUND

To the Members of the Society:

The J. A. Allen Memorial Fund, planned as a tribute to the memory of one of America's foremost mammalogists, continues to grow in a very gratifying manner. The success of the enterprise is assured and it is only a matter of time until the full $10,000.00—the goal set for the Memorial—is reached. The many friends of the late Dr. Joel Asaph Allen will be pleased to learn that through their efforts he will have a memorial as fitting and appropriate as it is unique.

Doctor Allen, in addition to being a great student of natural history, was a great editor and he loved publication and writing. His knowledge of the literature of natural history was profound and his own private library was unusually complete and well selected. To the memory of this great mammalogist and editor we offer a memorial of especial fitness. The ten thousand dollars, when turned over to the Trustees of the Society, will be invested and the principal kept intact forever. The interest from the fund will be devoted to such publication purposes as the directors may designate, their choice being influenced by the fitness of the publication as a memorial. It has been suggested that a very fine and permanent memorial would be created by the publication each year of a special number of the JOURNAL OF MAMMALOGY to be known as the J. A. Allen Memorial Number. By reserving the best manuscripts for this number the Society would build up from year to year an ever-growing memorial series containing the finest writings of its members. What testimonial could be better suited to the memory of Doctor Allen?

The fund stands today at $6,713.42, cash in bank and securities. Five bonds of $1,000.00 dollars each have been purchased and are held by the trustees. In addition to the above sum, $650.00 is pledged to the Fund, making the total assets $7,363.42. It is interesting to note the sources of the contributions.

The total figure, paid-in and pledged, comes from 310 contributors. Of these 77 are non-members of the Society and have donated $2,284.00. It will be noted that almost one-third of the Fund has been raised by friends of Doctor Allen who are not members of the American Society of Mammalogists. Surely the members of the Society will want to raise the major part of their own memorial and the remedy is obvious.

The outstanding contributions, the generous size of which has been the cause of the Fund's rapid growth, have already been acknowledged in detail either in the pages of this JOURNAL or by resolution at the annual meeting. Certainly the Fund has been fortunate in having friends who will contribute $100.00, $500.00 or even $1,500.00. However, the Central Committee feels that there are yet many members of the Society who have not contributed, who are not only financially able to do so but would be disposed to do so, if only they could be brought to give the Memorial the proper consideration. For the benefit of these members and in the hopes of securing as wide a response as possible, attention is directed to the following list which shows the number of contributors and the amount by states and countries. It will be seen that in some localities the mammalogists have not assumed their proportionate share of the responsibiltiy for the Memorial.

California	10	$285.00	Oregon	3	15.00
Colorado	4	45.00	Pennsylvania	12	260.00
Connecticut	3	151.00	Texas	3	17.00
District of Columbia	32	686.00	Washington	1	25.00
Idaho	1	2.00	West Virginia	1	3.00
Illinois	5	45.00	Wisconsin	3	25.00
Indiana	2	35.00	Canada	8	52.50
Iowa	1	20.00	Chile	1	10.00
Louisiana	1	100.00	China	1	5.00
Maine	1	5.00	Cuba	1	5.00
Massachusetts	13	715.00	England	1	10.00
Michigan	1	5.00	Holland	1	5.00
Minnesota	2	12.00	Mexico	1	7.00
Maryland	2	15.00	Philippine Islands	1	5.00
Mississippi	1	1.00			
Missouri	2	30.00		240	$6,519.50
Nebraska	1	25.00			
New Hampshire	2	25.00	Interest on bank deposits		193.92
New Jersey	3	25.00			
New York	113	3,723.00			
Ohio	2	125.00			$6,713.42

The Central Committee is very glad to receive contributions of whatever size and hopes that no one in sympathy with the Memorial will refrain from joining the movement because of the size of the contribution he would have to make. Aside from the fact that large sums in the aggregate may be raised by small contributions, the Committee rejoices at each new name added to the list of subscribers and hopes eventually to find every mammalogist sharing in this honor to the memory of Doctor Allen.

Checks should be made payable to the J. A. Allen Memorial Fund. They may be addressed care of H. E. Anthony, Secretary and Treasurer, American Museum of Natural History, Central Park West, New York City.

H. E. Anthony.

LIST OF MEMBERS OF THE AMERICAN SOCIETY OF MAMMALOGISTS

(Corrected to November 5, 1924)

Names of life members are marked with an asterisk.

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BUMSTEAD, COL. DALE, 811 North 1st Ave., Phoenix, Ariz.....Charter
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CABOT, WILLIAM B., 447 Marlboro St., Boston, Mass.....1922
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CAMPBELL, DR. J. A., 17 Elm St., Toronto Ontario.....1920

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CARTER, PROF. J. THORNTON, The Grange, Middle Green, Langley, Bucks, England.....1924
CARTER, T. DONALD, American Museum of Natural History, New York, N. Y.....1922
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CHASE, HENRY B., JR., Natural History Bldg., New Orleans, La.....1924
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COLLINS, DR. HOMER H., University of Pittsburgh, Pittsburgh, Pa.....1921
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DAVIS, R. N., Everhart Museum, Scranton, Pa.....1922
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GOODRICH, OSBORN, JR., W. O. Goodrich Co., Hopkins St., Milwaukee, Wis.....1924
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HAY, DR. OLIVER P., U. S. National Museum, Washington, D. C.....1921
HAYNES, ALTA H., (address unknown).....1922
HEDGES, CHARLES FOOTE, (address unknown).....Charter
HELLER, EDMUND, Field Museum of Natural History, Chicago, Ill.....Charter
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HORNADAY, DR. WM. T., N. Y. Zoological Park, New York, N. Y.....Charter
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HÓRRING, H., Mag. scient., Zoologisk Museum, Copenhagen, Denmark....1924
HORSFALL, R. BRUCE, 1214 16th St., N. W., Washington, D. C.....Charter
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HUARD, DR. V. A., 2 Richelieu St., Quebec, Quebec.....1922
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HUBBARD, C. ANDRESEN, 1249 E. Harrison St., Portland, Ore.....1921
HUBBARD, WYNANT D., Ibamba Ranch, Namwala Boma, via Monze, Northwestern Rhodesia, South Central Africa.....1922
HUBER, DR. ERNST, Dept of Anatomy, Johns Hopkins Medical School, Baltimore, Md.....1922
HUBER, WHARTON, Academy of Natural Sciences, Philadelphia, Pa.....1922
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HUNT, RICHARD M., Museum of Vertebrate Zoology, Berkeley, Calif..Charter
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JUDD, E. T., Cando, N. D.....1924
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KRUMSICK, MISS VICTORIA, 1214 Tennessee St., Lawrence, Kans.....1923
KURÁŽ, DR. RUDOLF, Czechoslovak Legation, 2040 S St., N. W., Washington, D. C.....1922
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*LANG, HERBERT, American Museum of Natural History, New York, N. Y.....Charter
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LYNCH, FRANCES C. C., Dept. of Interior, Ottawa, Canada.....1922
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MACKO, HARRY A., 935 Meadow Ave., Charleroi, Pa.....1923
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MARSH, R. K., 1660 Holly St., Denver, Colo.....1922
MARTIN, PROF. W. N., (address unknown).....1922
MATTHEW, DR. WM. D., American Museum of Natural History, New York, N. Y.....Charter
MCCALEB, C. C., 1638 Fell St., San Francisco, Calif.....1923
MCCAMPBELL, SAM C., State Agricultural College, Fort Collins, Colo....1924
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MCILHENNY, EDWARD A., Avery Island, La.....Charter
MCLAIN, ROBERT B., P. O. B. 132, Hollywood Station, Los Angeles, Calif.....Charter

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MEEK, M. W., ROUTE 1, Box 417, Arcadia, Calif.....1924
MELTON, BENJ. J., Bryan, Texas.....1924
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MURIE, ADOLPH, 219 7th Ave. S., Moorhead, Minn.....1924
MURIE, O. J., 219 7th Ave. S., Moorhead, Minn.....Charter
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NICHOLS, JOHN TREADWELL, American Museum of Natural History, New York, N. Y.....Charter
NORTON, ARTHUR H., Museum of Natural History, 22 Elm St., Portland, Me.....Charter
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DEATH OF N. HOLLISTER

At the time this number goes to press we are saddened by the loss of our beloved friend and fellow-worker,—N. Hollister, Editor of the Journal of Mammalogy. Mr. Hollister died at Garfield Hospital, Washington, D. C., November 3, 1924.

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